Hassan District is a compact, hitherto botanically unexplored area straddling the Western Ghats of Peninsular India. A wide range of climatic and topographic variations has endowed it with a broad spectrum of vegetational patterns ranging from arid scrub to wet monsoon forests.

An international team of Botanists headed by Dr. C.J. Saldanha and Dr. D.H. Nicolson has undertaken intensive field and laboratory studies on the flora of the area. As a result about 1,700 species of vascular plants are being reported. Dichotomous keys, brief descriptions and correct nomenclature make the volume a significant contribution to the study of tropical Botany. Its appeal is further enhanced by 132 original drawings and 20 color plates.

FLORA OF
HASSAN DISTRICT
KARNATAKA INDIA

Photo: W.D. Stevens

CEROPEGIA HIRSUTA Wt. & Arn. (Asclepiadaceae).
Flower of a twiner in the dry plain (p. 444).

QK
358
F56X
BOT.

TT 75-52079

FLORA OF HASSAN DISTRICT KARNATAKA, INDIA

EDITORS

CECIL J. SALDANHA
Head,
Department of Botany
St. Joseph's College,
Bangalore, India

DAN H. NICOLSON
Curator,
Department of Botany
Smithsonian Institution,
Washington, D. C., U. S. A.

With contributions by
T. P. RAMAMOORTHY, K. N. GANDHI,
S. S. HOOPER, W. D. STEVENS & Others

SMITHSONIAN
APR 21 1977
LIBRARIES

Published for the Smithsonian Institution and the National Science Foundation, Washington, D.C. by Amerind Publishing Co. Pvt. Ltd., New Delhi

1976

© 1976 *Amerind Publishing Co. Pvt. Ltd., and Cecil J. Saldanha*

Published for the Smithsonian Institution,
pursuant to an agreement with the
National Science Foundation, Washington, D. C.
by Amerind Publishing Co. Pvt. Ltd.,
66 *Janpath, New Delhi* 110001

Available from the U. S. Department of Commerce
National Technical Information Service
Springfield, Virginia 22161

Printed at Prem Printing Press, Lucknow, India
Production: M. L. Gidwani

PREFACE

The Hassan Flora Project was undertaken for several reinforcing reasons. Firstly, there is a need for well-supported floristic research to be carried on in an academic atmosphere in India, particularly in Karnataka State (this attracted local botanists). Secondly, there is a dearth of well-studied botanical collections from this part of the world, especially with adequate collection information (this attracted foreign collaboration). Thirdly, the authors enjoy floristic work and revival of knowledge that otherwise remains embalmed in rare, scattered and sometimes outdated botanical works.

The Hassan Flora Project was conceived by Dr. C. J. Saldanha (St. Joseph's College, Bangalore). Dr. Dan H. Nicolson (Smithsonian Institution, Washington, D. C.) collaborated in submitting a proposal for PL-480 funds. Such proposals require scientific and financial approval both from the Government of India and of the United States of America. On the Indian side the agency was the University Grants Commission. The Hassan Flora Project, initiated in November, 1968, was performed under a grant from the Smithsonian Institution's Special Foreign Currency Program.

It may be useful to others contemplating such works to know our costs. The total cost has been Rs 567,117. It should be understood that only Rupees were spent. No Dollars were involved. At the legal exchange pertinent to the project, the cost can be expressed as $ 74,621.

The Hassan District was a natural choice, given the need to have a research base in Bangalore where the Principal Indian Investigator is based. The District, with its small size and tremendous climatic changes within an ambit of 116 km (72 miles) is only 3 hours away by road from Bangalore.

Presentation of our findings in the form of a flora seemed desirable, if not to benefit those interested in a book on the flora of this part of India, to provide others with something to consider. With 1,700 species of vascular plants, it is a beginning of a flora of Karnataka since it probably accounts for 75% of the species of the State. It could be considered as a contribution to the revision of Gamble's "Flora of the Presidency of Madras" since it accounts for about 35% of the species of South India. It probably accounts for about 10% of the species of India.

The authors have pleasure in placing on record the valuable services rendered by Shri T. K. Venkatram without whose skill, accuracy and patience at the typewriter, the work would not have progressed.

The Director, Royal Botanic Gardens, Kew, the Director, Botanical Survey of India and the Regional Botanists of the Western and Southern Circles of the B. S. I. have been generous in their cooperation. Besides those who have contributed directly to the text, several other Botanists have read through parts of the manuscript and offered their valuable suggestions. Their help is gratefully acknowledged at the appropriate places in the text.

Capt. Machado has played host on many an occasion to the team. So also the Headmaster of St. Joseph's School in Hassan Town. To these cordial hosts and other collaborators the authors express their sincere gratitude.

CONTENTS

Preface iii
Alphabetical List of Families Dealt with in the Flora vii

Introduction 1
Key to Groups of Seed Plants 20
Descriptions of Families 31
Appendix (Thelypteridaceae) 856

Index 869

ALPHABETICAL LIST OF FAMILIES DEALT WITH IN THE FLORA

Name	*Page*	*Name*	*Page*
ACANTHACEAE	538	CHENOPODIACEAE	101
AGAVACEAE	801	CLUSIACEAE	123
AIZOACEAE	94	COMBRETACEAE	290
ALISMATACEAE	629	COMMELINACEAE	641
AMARANTHACEAE	101	CONNARACEAE	361
ANACARDIACEAE	372	CONVOLVULACEAE	463
ANCISTROCLADACEAE	171	CORNACEAE	299
ANNONACEAE	34	COSTACEAE	769
APIACEAE	414	CRASSULACEAE	207
APOCYNACEAE	427	CUCURBITACEAE	174
APONOGETONACEAE	635	CYCADACEAE	31
ARACEAE	781	CYPERACEAE	655
ARALIACEAE	412	DICHAPETALACEAE	326
ARECACEAE (PALMAE)	773	DILLENIACEAE	114
ARISTOLOCHIACEAE	54	DIOSCOREACEAE	806
ASCLEPIADACEAE	437	DIPTEROCARPACEAE	116
ASTERACEAE	595	DROSERACEAE	157
BALANOPHORACEAE	311	EBENACEAE	194
BALSAMINACEAE	399	ELAEAGNACEAE	295
BEGONIACEAE	172	ELAEOCARPACEAE	129
BIGNONIACEAE	534	ELATINACEAE	123
BIXACEAE	169	ERICACEAE	189
BOMBACACEAE	145	ERIOCAULACEAE	650
BORAGINACEAE	477	ERYTHROXYLACEAE	404
BRASSICACEAE	188	EUPHORBIACEAE	327
BUDDLEJACEAE	509	FABACEAE	215
BURMANNIACEAE	809	FLACOURTIACEAE	159
BURSERACEAE	369	GENTIANACEAE	421
CACTACEAE	92	GESNERIACEAE	528
CAMPANULACEAE	566	GNETACEAE	32
CANNACEAE	770	HALORAGACEAE	270
CAPPARACEAE	183	HIPPOCRATEACEAE	313
CAPRIFOLIACEAE	593	HYDROCHARITACEAE	632
CARYOPHYLLACEAE	97	ICACINACEAE	322
CELASTRACEAE	316	IRIDACEAE	801
CERATOPHYLLACEAE	60	JUNCACEAE	655

LAMIACEAE	494	PLUMBAGINACEAE	112
LAURACEAE	43	POACEAE	701
LEEACEAE	354	PODOSTEMACEAE	269
LECYTHIDACEAE	157	POLYGALACEAE	410
LEMNACEAE	790	POLYGONACEAE	108
LENTIBULARIACEAE	562	PONTEDERIACEAE	791
LILIACEAE	792	PORTULACACEAE	100
LINACEAE	406	POTAMOGETONACEAE	638
LOGANIACEAE	418	PRIMULACEAE	205
LORANTHACEAE	305	PROTEACEAE	295
LYTHRACEAE	272	RANUNCULACEAE	60
MAGNOLIACEAE	32	RHAMNACEAE	350
MALPIGHIACEAE	408	RHIZOPHORACEAE	297
MALVACEAE	146	ROSACEAE	211
MARANTACEAE	771	RUBIACEAE	569
MELASTOMATACEAE	286	RUTACEAE	379
MELIACEAE	389	SABIACEAE	69
MENISPERMACEAE	64	SALICACEAE	181
MENYANTHACEAE	475	SALVADORACEAE	322
MOLLUGINACEAE	94	SANTALACEAE	302
MORACEAE	75	SAPINDACEAE	363
MUSACEAE	760	SAPOTACEAE	191
MYRISTICACEAE	40	SAXIFRAGACEAE	210
MYRSINACEAE	200	SCROPHULARIACEAE	515
MYRTACEAE	277	SMILACACEAE	804
NAJADACEAE	636	SOLANACEAE	455
NELUMBONACEAE	58	STAPHYLEACEAE	361
NYCTAGINACEAE	91	STERCULIACEAE	138
NYMPHAEACEAE	57	SYMPLOCACEAE	198
OCHNACEAE	114	THEACEAE	119
OLACACEAE	299	THELYPTERIDACEAE	857
OLEACEAE	510	THYMELAEACEAE	275
ONAGRACEAE	283	TILIACEAE	132
OPILIACEAE	301	TRAPACEAE	277
OROBANCHACEAE	532	TYPHACEAE	758
ORCHIDACEAE	809	ULMACEAE	72
OXALIDACEAE	397	URTICACEAE	85
PANDANACEAE	777	VERBENACEAE	484
PAPAVERACEAE	71	VIOLACEAE	165
PASSIFLORACEAE	167	VITACEAE	356
PEDALIACEAE	561	XYRIDACEAE	640
PIPERACEAE	50	ZINGIBERACEAE	761
PITTOSPORACEAE	205	ZYGOPHYLLACEAE	397

Introduction

General geography

Hassan District, one of the nineteen districts of Karnataka State, is located between 12°31′ and 13°33′ N and 75°33′ and 76°38′ E. Its greatest length, from north to south, is about 129 km (80 miles) and its greatest breadth is about 116 km (72 miles). Its area is about 6,850 sq km (2,650 sq miles) (see foldout map).

A west to east cross section of South India through the Hassan District from the Arabian Sea to the Bay of Bengal would show a low, narrow, alluvial plain, the sudden rise of the Western Ghats to 1,500 m (5,000 ft), a slight drop to the Deccan plateau (ca. 900 m or 3,000 ft), a long, gradual dip to the Eastern Ghats followed by a low eastern alluvial plain ending at the Bay of Bengal. Hassan District begins at the base of the steep Western Ghats and continues into the gently rolling Deccan plateau.

Physiography

The Ghat region (*Malnad*) has the highest points in the District, Genkalbetta (1,389 m or 4,558 ft) and Murukangudda (1,300 m or 4,265 ft). The lowest point in the District is also in the Ghats at the Bisle Ghat border near Kulgunda village of South Kanara District at 150 m (495 ft).

The Plateau or plain (*Maidan*) to the east is gently rolling with a mean elevation of 900 m (3,000 ft). It has occasional outcrops or ranges which rise up to 300 m (1,000 ft) above the surrounding plain. Among the outcrops the largest complex is just north of Arsikere and includes Karekalgudda (1,250 m or 4,182 ft). The highest peak on the *maidan* is Sheegegudda (1,286 m or 4,218 ft) between Hassan and Belur. Smaller outcrops are found in the southern part of the plateau especially around Holenarsipur and Channarayapatna.

The Ghat region is drained to the West by a number of small- to medium-sized rivers which are part of the headwaters of the Netravati which empties into the Arabian Sea at Mangalore. The plateau is

drained by two systems, the Krishna and the Cauvery. Only a small portion of the District, around Arsikere, drains north and ultimately into the Bay of Bengal by the Krishna River. Most of the plateau section is drained by the Yagachi, Hemavathy and Cauvery each in turn a tributary of the other. The Cauvery also empties into the Bay of Bengal.

One of the most striking features of the plateau are the many dammed lakes or ponds called 'tanks' used to conserve available moisture. The new dam at Gorur near the confluence of the Yagachi and Hemavathy will generate a reservoir of considerable size.

In summary, there are 2 physiographic regions to Hassan District, the steep Western Ghats from 150 to 1,389 m and the rolling eastern plain at 900 m with occasional hills rising to 100-300 m above the plain.

Geology

The Hassan District lies on the Indian (Deccan) Shield and is composed of some of the oldest rocks in the world comparable to the Australian, Angara, African, Baltic, Guiana, Brazilian and Canadian Shields. The Deccan Shield in Hassan has rocks belonging basically to two systems—the Dharwar Schists and the Granitic Gneisses (Fig. 1).

The Dharwar Schists appear as elongate belts emerging from the younger Granitic Gneisses. Of the six belts occurring in the District the longest is to the east of Holenarsipur and extends north toward Doddagudda near Bageshpur. Another fairly long belt extends from east of Channarayapatna to just south of Arsikere. Sheegegudda the highest point on the plateau is part of a smaller schist belt to the north east of Hassan Town. Economically the Dharwar system has provided or could provide chromite, copper, asbestos, talc, kyanite, vermiculite, magnesite and garnets. Dharwar soapstone (steatite) was used extensively for the temples of Belur and Halebid with their innumerable and intricate carvings.

The Granitic Gneisses are considered to be younger than or intruding into the Dharwar system. Three major intrusions are found in the District, Peninsular Gneiss, the Charnockite (or Nilgiri) Gneiss and the Closepet (Bellary or Ramnagar) Gneiss. These Gneisses are the principal source of building stone but also of beryl, kaolin (China clay), mica (muscovite) and feldspar in Hassan.

The Peninsular Gneiss is the oldest granite intrusion in Hassan and must have been a massive flooding of the Dharwar system because today it covers practically all the District. Indrabetta with the 17 m (57 ft) monolithic statue of Gommateshwara at Sravanabelagola is of Peninsular Gneiss. Because the Peninsular Gneiss has strong master joints it can easily be fire-quarried into broad and long pieces of constant thickness.

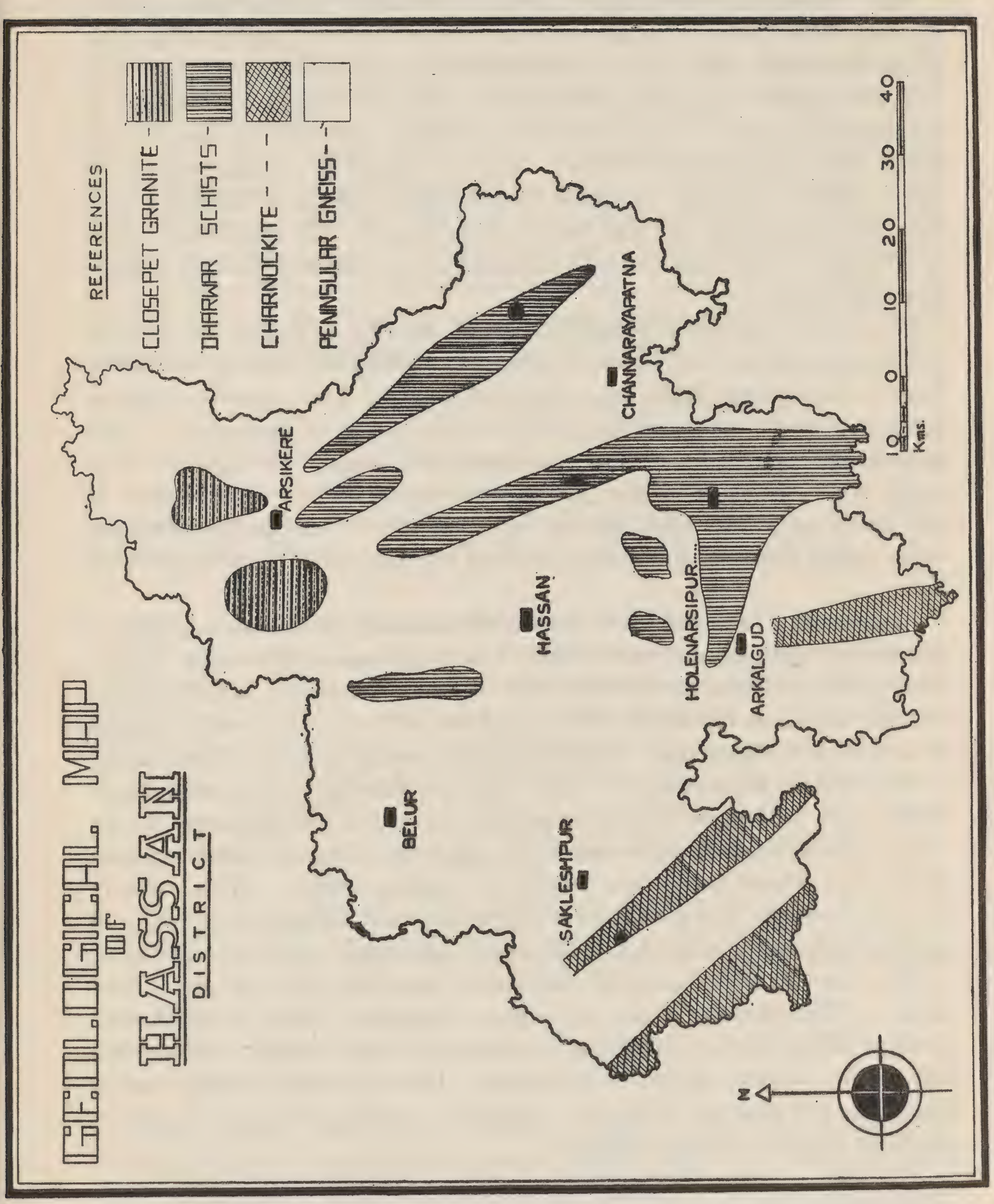


Fig. 1. Geology map of Hassan District (adapted from Rama Rao).

This granite, characteristic of this part of India, is very much in use for various purposes, even, till recent years, for telephone and electric poles.

The Charnockite or Nilgiri Gneiss is found in Hassan only in the Western Ghat section. Apparently this Gneiss is also the major component of the Shevaroy, Nilgiri and Palni Hills farther south along the Ghats.

The youngest (but still Precambrian) is the Closepet (Bellary or Ramnagar) Gneiss. This is found in Hassan only in two places, one north and one west of Arsikere. This formation is striking because it often appears as huge, irregular bosses visible for great distances and sometimes described as "the bones of the earth". A spectacular band of Closepet Gneiss runs through Tumkur, about halfway between Bangalore and Hassan.

One other geological formation, fossil laterite is found in Hassan. It is interesting that laterite was so named in 1800 in Malabar by a botanist, Francis Buchanan-Hamilton. The existence of fossil laterite capping granitic gneisses is in evidence a little to the north of Bageshpur. This fossil laterite forms under wet conditions and implies the existence of a much wetter climate on the plateau than exists today. The process is still going on in the Ghat section and is noticeable especially along the roads being built for the construction of the Hassan-Mangalore railway line.

In summary, one can characterize the geology of Hassan as lacking appreciable sedimentary rock, largely being covered by Peninsular Gneiss with bands or outcrops of the Dharwar Schist complex, a little Charnockite Gneiss in the Ghat section and two outcrops of Closepet Gneiss near Arsikere (Rama Rao, *A Handbook of the Geology of Mysore State*, 1962).

The soils of Hassan are of three types, red-soils, laterite and black cotton soils. Most of Hassan is covered by red to brown sandy loams which are intensively cultivated by applying inorganic and organic fertilizers. These loams are neutral to slightly acidic. Their color is variable from place to place and is dependent on the kind and quantity of various hydrated iron oxides. These soils intergrade with the other two.

The lateritic soils (latosols) are found especially in the wet, Ghat section. The surface is full of organic materials when under forest. Erosion of the surface following lumbering or road cutting exposes the soft laterite which hardens upon drying. It can be very slippery and a hazard to the itinerant botanist. The soil is acidic, pH of 5 to 6, due to leaching of soluble bases and salts.

The black cotton (Regur) soil is only found in the north-eastern tip of Hassan. It is basic, pH of 7.5-8.5 and is distinctive for its strong shrinkage and deep cracking when dried.

Local variations, due to exposure, permeability, water table, etc., can cause major variations on these three soil types.

Climate

A wide range of climatic conditions is characteristic of the District. The temperature at the foot of the Ghats (150-200 m) is higher than that on the plateau (900 m). Temperature readings from Hassan indicate that December is generally the coldest month with a mean daily minimum of 14°C (55°F) and mean daily maximum of 27°C (81°F). The temperature rises in early March and hot summer follows winter with April being the hottest month with a mean daily maximum of 34°C (93°F) and a mean daily minimum of 20°C (68°F). On particular individual days the temperature may go over 35°C (95°F). With the arrival of the monsoon in May-June there is an appreciable cooling. A slight rise is once again noticed towards the close of the monsoon in October. Average night temperatures in December-January are the lowest.

Table 1. Mean Daily Temperature in °C in Hassan

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
Maximum	28	30	33	34	32	27	25	26	27	28	27	27	29
Minimum	14	15	18	20	20	19	19	19	18	18	16	14	18

The overall mean annual rainfall reported for Hassan District is 104.07 cm (41 in.). There are figures on rainfall from several stations indicating a broad range both in the amount of precipitation as well as in the period during which it rains. The following table of annual rainfall compares Maranhalli (western Hassan) with Arsikere (eastern Hassan). On an average Maranhalli gets 596 cm (235 in.) of rain per year with a maximum of 764 cm (300 in.) while Arsikere gets only 66.1 cm (26 in.) with a maximum of 83 cm (33 in.) and a minimum of 38.6 cm (15 in.).

Table 2. Total Rainfall in cm by Years

	1951	1952	1953	1954	1955	1956	1957	1958	1959	Average
Maranhalli	515	481	580	595	497	661	578	724	764	596
Arsikere	55.6	62.0	83.0	62.5	60.2	38.6	79.2	79.6	74.0	66.1

There is also a difference in rainfall pattern through the year between stations in eastern and western Hassan District (Fig. 2). Graph 1 shows that in Saklespur (western Hassan) the rain falls mostly during June-August (south west monsoon) with a minor peak during October (north east monsoon). Graph 2 shows that Arsikere (eastern Hassan) gets most of its rainfall in October-November (north east monsoon) with a minor peak in May (preceding south west monsoon).

Comparison of when most rainy days (with more than 2.4 mm or 0.1 in. rain) occur during the year shows the great difference between eastern and western Hassan District. In Saklespur (western Hassan) more than three weeks per month are rainy during July and August. In Arsikere (eastern portion) only during September and October is there slightly more than one week of rain (cf. Abishankar, *Mysore State Gazeteer—Hassan District.* 1971).

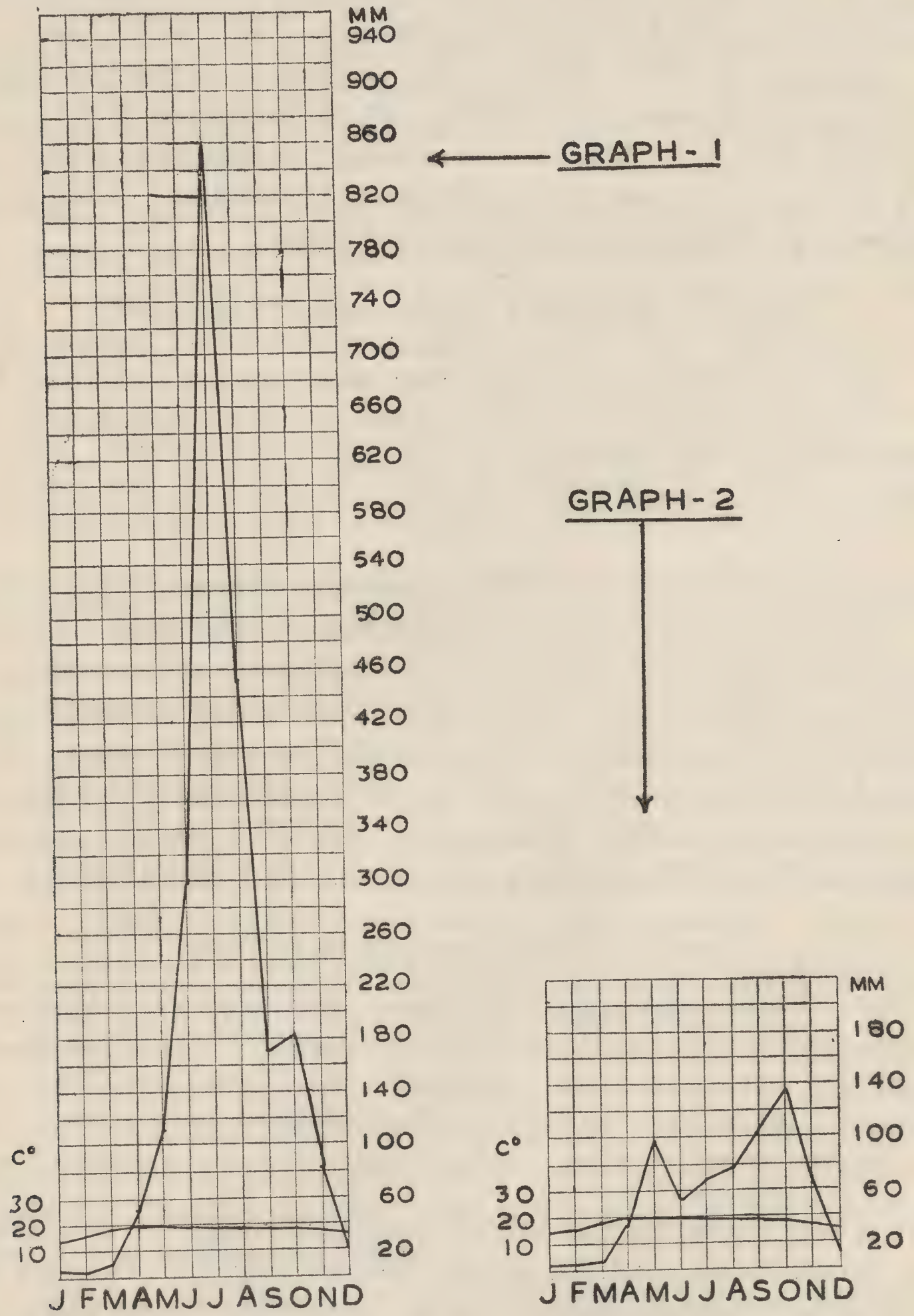


Fig. 2.

Graph 1. Western Hassan Dt. Monthly rainfall at Saklespur and average minimum temperature in Hassan Town.

Graph 2. Eastern Hassan Dt. Monthly rainfall at Arsikere and average minimum temperature in Hassan Town.

In summary, Hassan District shows two different climatic extremes, the dry eastern portion with an average of 66 cm (26 in.) annual rain coming mostly in the north east monsoon and the wet western portion with 596 cm (235 in.) of rain coming mostly in the south west monsoon. The fact that these tremendous climatic differences exist within 116 km (72 miles) at about the same elevation implies the existence of a complex and rapidly changing transitional zone.

MAN

History

Man has set his mark on the Hassan *maidan* since prehistoric times. Some paleolithic remains have been found, the principal being megalithic monuments, including stone circles of 25 ft diameter near Kondajji.

The earliest historical event in Hassan is the immigration of the Jain emperor Chandragupta who abdicated his throne in 298 B.C. and as a devotee, followed his guru to Sravanabelagola. Rock inscriptions on Chandragiri dated 700 A.D. bear testimony as do later inscriptions elsewhere.

During the fourth and fifth centuries, parts of the District were under the Kadambas with their seat at Banavasi. The oldest inscription in Kannada found at Belur and dated 450 A.D. refers to the Kadamba kings.

Several dynasties followed the Kadambas. The Gangas were responsible for the construction of the Gommateshwara monolith in 983 A.D. The Cholas were next in power but were supplanted by the Hoysalas in 1116 A.D.

Hassan District is particularly identified with the Hoysalas. The richly decorated temples at Belur and Halebid (Dwarasamudra) were built by the Hoysalas from 1117 to 1219 A.D. There seemed to have been a flourishing trade with the west coast through the mountain tracks at Shiradi and Bisle. However the Hoysala power gradually declined especially after the sack of Halebid in 1300 A.D. The Vijayanagar kings took over from the Hoysalas in 1361 and continued till about 1565. Several local chieftains rose to power at Balam (Saklespur), Nuggehalli, Holenarsipur and other centers. The Wodeyars, who came to power in Mysore, ruled the District from 1631 to about 1950 except for the brief interlude of the Hyder Ali and Tippu sultanates in the second half of the eighteenth century and of direct British rule from 1813 to 1881. The Ghat tracks were opened up for Tippu's armies during their march to the coastal plain around Mangalore. The fortress at Manjarabad, commanding the strategic routes to the Bisle and Shiradi Ghats was built during Tippu's time. In 1950 Mysore became a State of the Indian

Union with certain additions, including most areas speaking Kannada, and the Maharaja (Great King) of Mysore became the titular Rajapramukh (Governor). The name of the State was changed from Mysore to Karnataka on November 1, 1973.

There can be little doubt that the ecology of the entire *maidan* was gradually changed by man right from prehistoric times. The *malnad*, however, was modified only during the last two centuries and its vegetation is perhaps being overexploited at present. It was probably during the direct British rule of the District from 1831 to 1881 that several parts of the *malnad* were thrown open to British planters—often ex-armymen who had changed over to civilian occupations at the end of the Anglo-Mysore wars. Kadamane, Biccodu, Cognur, Karadi-Betta, Barchinhulla. Matsagar are only a few of the estates dating from this period. The early planters gradually cleared forest tracts and planted them with the shadeloving coffee and cardamum, the tall areca and the bushy orange. Ceara rubber once formed a profitable crop but has now been practically given up. Tea was introduced at Kadamane in the early twentieth century and now constitutes the major produce of this estate.

Since 1945 there has been a spurt in the plantation industry so that the original vegetation has been greatly altered. There is scarcely any virgin forest in private hands. Even the major State Forests at Kenchankumri, Kagenari, Bisle and Kabbinhalla are being depleted rapidly by selective felling of hard structural timbers as well as soft woods for the plywood amd match industries.

Hassan District was famed till recently for its animal wild-life, both big and small. Indiscriminate hunting, and the ruthless reduction of forests has upset the ecosystem so much that there is very little big game left today. The large cats—tigers and panthers—have almost disappeared; one occasionally meets stray herds of elephants; the Gaur (Indian Bison) is being driven to restricted and inaccessible hideouts. Strong action might be needed if some of the beauty and grandeur of the *malnad* should survive for posterity.

People

The population of Hassan has doubled in the last 100 years, from 518,934 in 1871 to 1,098,884 (provisional figures) in 1971. The population density went from 76 per sq km (197 per sq mile) to 162 per sq km (421 per sq mile) in that period. Most of the growth has occurred in the last two decades, each averaging about 25% increase over the previous total.

About 85% of the people have Kannada as their mother tongue, followed by 4.4% Urdu, 3.2% Tamil and 1.6% Telugu. Only about

1,300 and 75 respectively claim Hindi and English as their mother tongue. Almost 94% of the people are Hindus, 5% are Muslims and 1% are Christians.

BOTANICAL HISTORY

Earlier collections

Hassan District was bypassed when J. D. Hooker's *Flora of British India* was being written. However, some of the Planters and Forest Officers published a few practical books on the plantation crops and forest trees of the District. Serious botanical collections began at the beginning of this century. Charles Barber came out to India in 1898 to take up the post of Director of the Botanical Survey of Southern India. He visited the District in 1903 and 1905. Specimens collected by him around Saklespur and Kadamane (Cadamony) are now at Coimbatore (MH) and Kew (K).

A. Meebold, an Austrian Botanist, visited the District twice in 1908. His first visit in February was by train up to Arsikere and then by road to Hassan, Agalhatti and the Shiradi Ghat (Gundiar Ghat). His second trip was in October-November of the same year. Meebold has left us an account of his trip in his paper *Die Vegetationsverhaltnisse von Maisor* (Jahresber. Schles. Ges. Vaterl. Cult. 87: 35-46. 1909). Part of his collection is at Kew; it served as material for Hooker's studies on *Impatiens*. The only specimen of *Viscum mysorense* Gamble was collected by Meebold near Arsikere during his first visit.

Gamble (*Fl. Madras*), while not directly covering Mysore, did take cognisance of the Barber and Meebold collections from Hassan District.

Since the revival of the Botanical Survey of India in 1954, the District was visited by the Survey staff, who spent about 8 days in the region from 1957 to 1963. Their collections running to about 383 field numbers are at Poona (BSI).

Present collections

Dr. C. J. Saldanha has been collecting specimens in the District since 1965. With the inauguration of the Hassan Flora Project in November 1968, the project staff and visiting botanists stepped up their field trips so that two to three trips each lasting 4-5 days were undertaken every month. Care was taken to cover the different vegetational zones during each trip. Thus the entire District was covered right through the year and this over a period of 3-4 years. Our collections exceed 9,000 field numbers. A complete set has been kept at St. Joseph's College,

Bangalore. Representative collections have been deposited at the U.S. National Herbarium and at Kew. Other herbaria will be given specimens in due course.

The scientific staff consisted of Dr. C. J. Saldanha, Shri T. P. Ramamoorthy and Shri K. N. Gandhi. Dr. Dan H. Nicolson directed the project from its inception and joined the team for 2-3 months every year. Among our collaborators, Dr. Frances M. Jarrett (Kew) and Miss Sheila Hooper (Kew) spent 2-3 months in the field. Dr. Jarrett is writing up the ferns and fern allies while Miss Hooper has handled the Cyperaceae. Mr. Warren Douglas Stevens of Michigan State University joined us for three months and has written up the Apocynaceae, Asclepiadaceae and Loganiaceae. Prof. R. E. Holttum has contributed the treatment of the Thelypteridaceae and Dr. B. C. Stone that of the Pandanaceae.

Collecting methods

Collections though discriminatory in the later years, were thorough

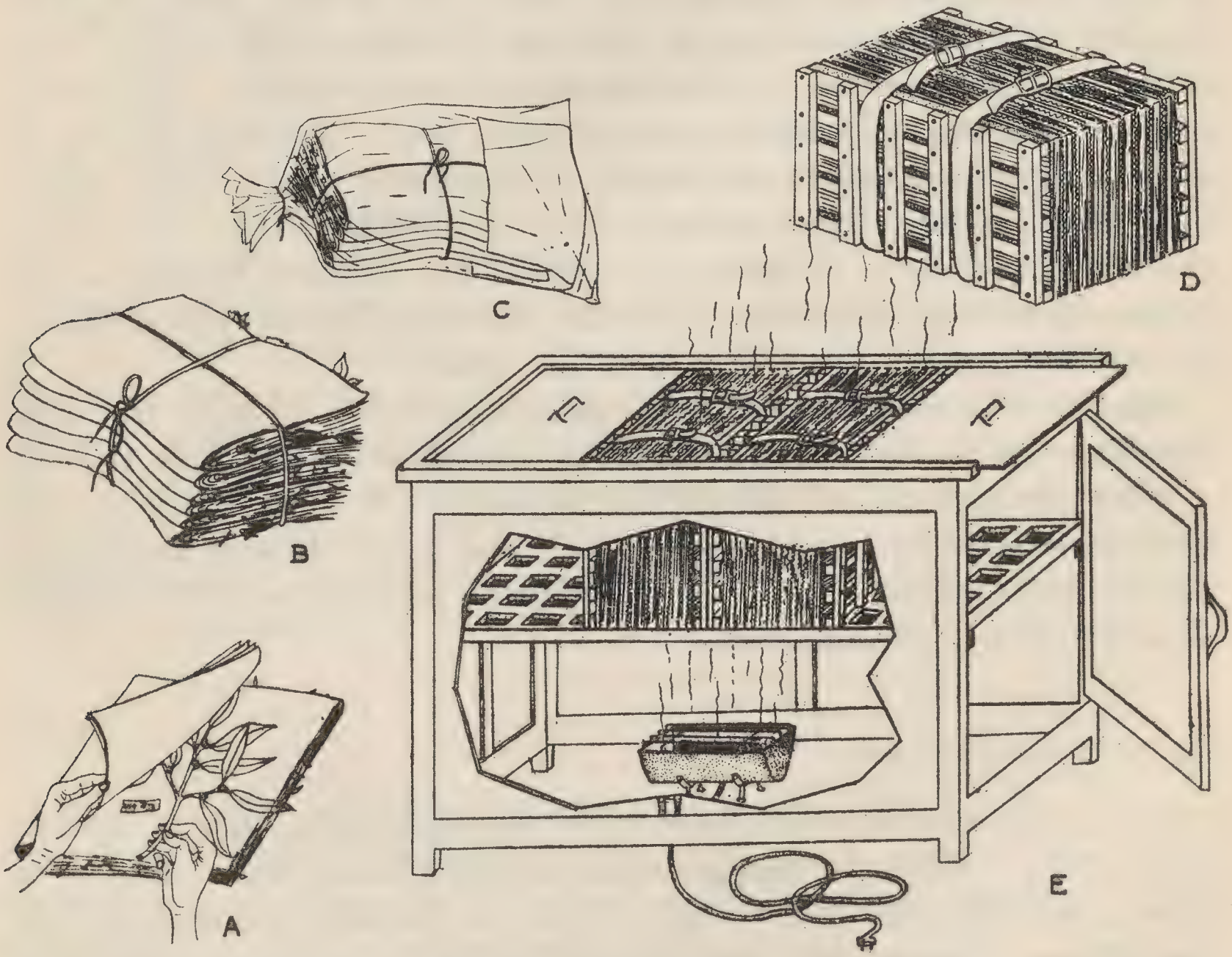


Fig. 3. WET METHOD OF PLANT PRESSING. *A.* plants pressed in newspaper fascicles in the field; *B.* bundle of fascicles; *C.* polythene bags with specimens pickled in formalin solution; *D.* wooden press with specimens in blotters interleaved with aluminum corrugates; *E.* drying box for rapid desiccation of specimens by convectional current of hot air.

in the earlier years when representative material of anything in flower or fruit was collected. On the spot notes were entered into field-books specially prepared to elicit complete information. Flowers were generally pickled in appropriate media. Problematic herbaceous plants, especially epiphytes, were cultivated in St. Joseph's College garden in Bangalore and studied when flowering or fruiting.

The wet method was used in pressing plants. Fresh specimens were numbered and pressed immediately in the field between sheets of newspaper fascicles held together in light wooden field presses. These fascicles were then transferred to large polythene bags and pickled in an aqueous solution of 6% formalin. The specimens were next spread out carefully between drying sheets, on the party's return to Bangalore. Specimens and blotters interleaved with aluminum corrugates were again bound together in wooden presses and rapidly desiccated in a drying box by a convectional current of hot air (Fig. 3). The method has proved extremely successful both with regard to the quality of the specimens as well as in the reduction of the time and labor involved in the use of the traditional dry method with the daily change of drying sheets, the use of volatile alcohol and dangerous mercuric chloride. However, very slender herbs and delicate flowers were pressed separately in smaller blotters. This helped conserve their delicate petals and retain some of the original color.

VEGETATION

The extreme variations in climatic conditions, especially in rainfall, naturally result in a wide range of vegetational patterns.

The *maidan* has been cultivated from ancient times either with rainfed crops or with the help of the numerous tanks. However, certain areas have been more or less protected and so offer interesting pockets of vegetation typical of the particular region. Examples of open scrub can be noticed in the dry eastern region around Channarayapatna and Arsikere especially in the Ramanahalli and Belvathally State Reserves and along the lower slopes leading to Nagpuri in Arsikere Taluk. *Canthium parviflorum* Lam., *Cassia auriculata* L., *Dodonea viscosa* Jacq., *Erythroxylum monogynum* Roxb., *Pterolobium hexapetalum* (Roth) Sant. & Wagh, *Rhus mysurensis* Heyne ex Wt. & Arn., and *Tarenna asiatica* (L.) O. Kuntze ex Schum. are the common shrubs in this region. The succulents *Caralluma umbellata* Haworth, *Coleus caninus* (Roth) Vatke, *Euphorbia antiquorum* L. and *Sarcostemma acidum* (Roxb.) Voigt are admirably adapted to the xerophytic conditions prevailing here. The gravelly soil is sparsely covered by a few prostrate herbs with well-developed rootstocks among which *Andrographis serpyllifolia* Wight, *Stylosanthes fruticosa* (Retz.) Alston and

Tephrosia calophylla Beddome may be mentioned. The stunted, prickly vegetation of this area is a direct response to the dry climate, poor soil conditions and the merciless, hot sunshine.

As climatic and soil conditions improve a number of trees, mostly deciduous, establish themselves. The *Acacias* are early colonizers and are soon replaced by the dry deciduous flora. *Anogeissus latifolia* (DC.) Beddome, *Boswellia serrata* Roxb. ex Colebr., *Buchanania lanzan* Sprengel, *Butea monosperma* (Lam.) Taub., *Cochlospermum religiosum* (L.) Alston, *Diospyros montana* Roxb., and *Semecarpus anacardium* L. f. are characteristic of these communities. Among the climbing or scandent plants are *Cadaba fruticosa* (L.) Druce, *Gymnema sylvestre* (Retz.) R. Br., *Jasminum roxburghianum* Wall. ex C. B. Clarke, *Ichnocarpus frutescens* R. Br. and *Secamone emetica* R. Br. *Argyrea cuneata* (Willd.) Ker-Gawler with its deep purple flowers is an attractive sight when in bloom. Large specimens of *Cycas circinalis* L. are interesting features of some of the ravines in the drier regions.

After a few showers the bulbous species come into their own. Among them are *Crinum asiaticum* L., *Habenaria roxburghii* Nicolson, *Scilla hyacinthina* (Roth) Macbride and *Urginea indica* (Roxb.) Kunth.

The vascular cryptogams are relatively few and represented by *Actiniopteris radiata* (Sw.) Link, *Cheilanthes mysurensis* Hooker and *Selaginella longipila* Hieron.

A further transition toward a richer flora occurs with the advent of several species of *Terminalia* especially *T. bellirica* (Gaertn.) Roxb., *T. chebula* Retz. and *T. crenulata* Roxb. *Tectona grandis* L. f. is rather limited in distribution but *Santalum album* L., *Pterocarpus marsupium* Roxb. and *Shorea roxburghii* G. Don are common and of considerable economic value. Patches of these forests may be observed at Nagpuri in Arsikere Taluk and in the Byra and Bourdalboore State Reserves in Hassan Taluk. The roads in these areas are often lined with trees, the common ones being *Ficus benghalensis* L., *Ficus drupacea* Thunb. var. *pubescens* (Roth) Corner, *Mangifera indica* L., *Thespesia populnea* (L.) Solander ex Correa and *Syzygium cumini* (L.) Skeels. An occasional clump of *Phoenix sylvestris* Roxb. may be noticed where the water table is rather high.

As the rains commence the ground is covered by several grasses interspersed with the tuberous *Habenaria marginata* Coleb. and the parasitic *Sopubia, Striga* and *Centranthera.*

The *maidan* is dotted with numerous irrigation tanks often supporting an interesting aquatic flora. *Ceratophyllum demersum* L. and *Hydrilla verticillata* (L. f.) Royle are generally completely submerged. *Pistia stratiotes* L., *Spirodela polyrhiza* (L.) Schleider, *Utricularia exoleta* R. Brown and *Wolffia arrhiza* (L.) Wimm. float freely on the surface. In deep standing water *Nelumbo nucifera* Gaertner, *Nymphaea pubescens* Willd., *Nymphoides*

cristatum (Roxb.) O. Kuntze and *N. indicum* (L.) O. Kuntze spread their rounded leaves and raise their attractive flowers. As the depth of the water decreases *Cyperus pangorei* Rottb., *Limnophyton obtusifolium* (L.) Miq. and *Typha angustata* Chaub. & Bory begin to establish themselves. The edges are generally characterized by *Ipomoea aquatica* Forsk., *Leersia hexandra* Swartz, *Polygonum glabrum* Willd. and *Oryza rufipogon* Griff. The grassy meadows around the tanks are interlaced with *Centella asiatica* (L.) Urban and *Phyla nodiflora* (L.) Greene or studded with the red of *Drosera burmannii* Vahl. Aquatics like *Vallisneria spiralis* L. and *Ottelia alismoides* Pers. usually grow in the canals draining the irrigation tanks.

Depending on places and seasons, farmland successions can also be noticed in fallow or abandoned fields. If the moisture is sufficient there is a rich cover of herbaceous flora lasting till the dry months of February-March. But if the soil is poor, dry and neglected, the area is generally invaded by *Dodonea viscosa* Jacq. and later colonized by dense stands of *Phoenix humilis* Royle var. *pedunculata* Becc. Large patches of the latter are seen near Balupet and Tagare in the region where the *maidan* breaks up into the *malnad*. The peculiar *Tylophora rotundifolia* Ham. with its large follicles is a characteristic plant found among the *Phoenix* shrubs.

Rolling green hills with narrow paddies in their shallow valleys are typical of the areas around Arehalli, Saklespur and Hettur. Where the soil is rich and humidity high, wet deciduous trees form compact associations especially along streams and on steep slopes. These wooded patches have often been cleared and replanted with coffee and the accompanying shade trees. But when the rainfall is higher and water assured, the canopy has been left standing. However, the undergrowth has been cleared and replanted with *Elettaria cardamomum* (L.) Mat. Common among the native trees are *Apodytes dimidiata* E. Meyer ex Arn., *Aporosa lindleyana* (Wight) Baillon, *Careya arborea* Roxb., *Celtis tetrandra* Roxb., *Gmelina arborea* Roxb., *Litsea floribunda* (Blume) Gamble, *Mallotus tetracoccus* (Roxb.) Kurz, *M. philippensis* (Lam.) Mueller and *Trichilia connaroides* (Wt. & Arn.) Bent. Shrubs and climbers may be noticed in the uncleared areas. The white of innumerable Jasmines and Mussaendas stands out against the green of the seasonal foliage. The dark coriaceous leaves and large flower-bunches of *Shefflera venulosa* (Wt. & Arn.) Harms and *S. wallichiana* (Wt. & Arn.) Harms drape the larger trees in summer. Epiphytes also abound in this zone. As the cold season ends and the dry hot summer commences, the pale lavender of *Dendrobium barbatulum* Lindl. is replaced by the orange of *D. nutans* Lindl., the scented pink of *Aerides crispum* Lindl. and the speckled white of *Rhynchostylis retusa* Bl. The long, scarlet flowers of *Aeschynanthes perrottetii* A. DC. and the white bell-shaped corollae of *Fragraea ceilanica* Thunb. enhance the attractiveness of this area during the monsoon.

It is, however, in the larger valleys opening on to the western alluvial

plains that the flora of the District attains its real splendour. The Kabbinala, Kempuhole, Kenchankumri, Kagenari and Bisle forests, situated in these valleys receive the full force of the south west monsoon. They offer good examples of seasonal rain forests and have been termed 'Ghat rain forests' by Kadambi (*The Ghat Rain forests of Hassan District, Mysore State,* Quart. J. Mysore Forest Dept. 1-31; 61-85. 1944-45). There is a good admixture of evergreen and wet deciduous trees that have to thrive during a very wet monsoon of 3-4 months as well as during a long dry period when there is scarcely a drop of rain. These forests are, therefore, semi-evergreen rather than truly evergreen in comparison to the tropical rain forests of equatorial Asia.

The canopy trees in these Ghat forests may be over 40 m tall and are festooned with innumerable climbers and epiphytes. Due probably to regular lumbering operations the canopy tends to be open. Possibly for the same reason, distinct stratification is not conspicuous. The area abounds in soft-wood species. *Alstonia scholaris* (L.) R. Br., *Artocarpus hirsutus* Lam., *Calophyllum apetalum* Willd., *Dipterocarpus indicus* Bedd., *Kingiodendron pinnatum* (Roxb.) Harms, *Lophopetalum wightianum* Arn., *Michelia champaca* L., *Myristica dactyloides* Gaertner and *Vateria indica* L. are some of the larger and commercially valuable soft woods. The hardwoods are represented by *Dalbergia latifolia* Roxb., *Diospyros sylvatica* Roxb., *Lagerstroemia microcarpa* Wight and *Vitex altissima* L. f. It is interesting to note that *Mesua ferrea* L. and *Poeciloneuron indicum* Bedd., so common in the other parts of the Western Ghats are rare in the Hassan District. As for palms, *Arenga wightii* Griff., *Calamus pseudotenuis* Becc., *Caryota urens* L. and *Pinanga dicksonii* (Roxb.) Scheffer are frequent. Among the woody climbers are *Bauhinia phoenicea* Heyne ex Wt. & Arn., *Entada pursaetha* DC., *Gnetum ula* Brong. and *Wagatea spicata* Dalz. Natural forest glades are usually dotted with *Salmalia malabarica* (DC.) Schott & Endl., *Emblica officinalis* Gaert. and *Dillenia pentagyna* Roxb. *Trema orientalis* (L.) Blume, *Callicarpa tomentosa* (L.) Murr. and *Macaranga peltata* Mueller establish themselves along road cuttings and clean-felled areas. The epiphytic *Pothos scandens* L. and *Raphidophora laciniata* (N. Burman) Merr. clothe many tree trunks right through the year.

The herbaceous monsoon flora of these forests is rich and interesting. Besides liverworts, lichens, mosses and ferns, innumerable flowering plants thrive during the wet season. The ground orchids *Nervilia* and *Eulophia* sprout with the first rains. As the monsoon gains strength the tree trunks are draped with the pink of *Impatiens barberi* J. Hooker, the white of *Impatiens stocksii* J. Hooker & Thomson and the green of *Pleopeltis nuda* Hook. *Trichomanes intramarginale* Hook. & Grev. and *T. plicatum* (Bosh) Bedd. clothe the lower portion of these trunks with their delicate lace-work. The epiphytic *Belosynopsis vivipara* (Dalz.) Fischer completes

its entire life-cycle during this wet season. During these torrential rains even the rocks are covered with *Epithema carnosum* (G. Don) Bentham, *Impatiens scapiflora* Heyne ex Roxb., *Sonerila rheedii* Wt. & Arn. and *Sonerila rotundifolia* Bedd.

The exposed peaks are either smooth and grassy or are bold, deeply scarred, granitic outcrops dry in summer but teeming with life during the wet season.

A good example of the first type is the western face of Genkalbetta carpeted during the monsoon mists and rains by the green of *Jansenella griffithiana* (C. Muell.) Bor, *Isachne setosa* Fischer, *Sporobolus piliferus* (Trin.) Kunth and *Themeda tremula* (Steud.) Hack. Common among the herbs that dot this carpet are *Drosera peltata* Smith, *Exacum bicolor* Roxb., *Pedicularis zeylanica* Benth., *Satyrium nepalense* Don, *Sopubia delphiniifolia* (Roxb.) G. Don and *S. trifida* Ham. ex D. Don. *Adenoon indicum* Dalz., *Nilgirianthes warrensis* (Dalz.) Bremek. and *Phlebophyllum canaricum* (Bedd.) Bremek. are some of the low stunted shrubs in hollows on these windswept heights. The rills that start on these peaks soon develop into wooded torrents nurturing a shola-type vegetation including *Cinnamomum sulphuratum* Nees, *Dysoxylum binectariferum* (Roxb.) J. Hooker, *Elaeocarpus tuberculatus* Roxb., *Gordonia obtusa* Wall. ex Wt. & Arn. and *Symplocos cochinchinensis* (Lour.) Moore ssp. *laurina* (Retz.) Nooteb.

The second type of grey granitic peaks can be studied on the western flank of Vanagur peak. The bare rocks of summer blossom forth with a myriad of lithophytes during the wet months. *Eriocaulon truncatum* Ham., *Parnassia mysorensis* Heyne ex Wt. & Arn. and *Thalictrum dalzellii* J. Hooker are among the many ephemerals here.

The rheophytic vegetation along the streams and rivulets in the Ghat section constitutes another interesting ecosystem. A number of trees grow along the banks of these streams. At higher altitudes are found *Carallia brachiata* (Lour.) Merrill, *Diospyros pruriens* Dalz., *Helicia nilagirica* Bedd., *Microtropis stocksii* Gamble and *Vaccinium neilgherrense* Wight. At lower levels along the Ghats *Calophyllum apetalum* Willd., *Desmos lawii* (Hook. & Th.) Safford, *Madhuca neriifolia* (Moon) H. T. Lam are just a few representatives. *Ochlandra scriptoria* (Dennst.) Fischer is a common reed along the flat banks. But when these are precipitous *Angiopteris evecta* (Forst.) Hoffm. and *Cyathea gigantea* (Wall. ex Hook.) Holttum thrive well. *Cryptocoryne retrospiralis* (Roxb.) Kunth, *Lagenandra ovata* (L.) Thw. and *Osmunda regalis* L. occur in patches along the water line.

The boulder-strewn beds of these mountain torrents are completely submerged by the raging waters during the monsoon. But they are partially exposed in summer and support deep rooted shrubs like *Homonoia riparia* Lour., *Rotula aquatica* Lour. and *Syzygium heyneanum* Wall. ex Gamble. Individual boulders are often adorned by *Leptochilus decurrens* Bl. or by the

delicate tracery of *Hydrobryopsis* and *Terniola.*

To sum up, there are 2 distinct vegetational types in the District. The dry scrub and deciduous vegetation of the eastern *maidan* contrasts sharply with the verdant Ghat forests. Intermediate forms of wet deciduous, grassland and shola communities may be seen in localized patches. Associations of aquatic, lithophytic and rheophytic plants occur in specialized ecological niches.

Economic botany

The present flora does not deal with cultivated plants and economic crops but only covers the native or naturalized plants of the District. However, agriculture and forestry are basic to the economy of the District. 53% of the land is cropped and 7% is declared as forest for revenue purposes. Hence a brief account on agriculture and forestry may not be out of place.

In the *maidan* the most important cereal crop is *Eleusine coracana* (L.) Gaert. Other cereals are *Pennisetum typhoides* (N. Burman) Hubbard, *Sorghum* and *Zea* hybrids. *Oryza sativa* L. with its innumerable variations is grown in the irrigated fields around Channarayapatna and Belur. Sugarcane is also another common irrigated crop.

Pulses are often cultivated in rotation with the cereals. *Arachis hypogea* L., *Cajanus cajan* (L.) Millsp., *Cicer arietinum* L., *Vigna mungo* (L.) Hepper, *Vigna unguiculata* (L.) Walp. are the common legumes. *Glycine max* (L.) Merrill is just being introduced in some areas.

Among the commoner vegetables are *Abelmoschus esculentus* (L.) Moench, *Cucumis sativus* L., *Cucurbita maxima* Duch., *Momordica charantia* L. and *Trichosanthes anguina* L. *Ipomoea batatas* (L.) Lam. and *Solanum tuberosum* L. are some of the tubers cultivated around Hassan Town.

Groves of *Areca catechu* L., *Cocos nucifera* L. and *Mangifera indica* L. occur around villages.

Nicotiana tabacum L. is being increasingly cultivated and Magge is fast developing as a tobacco marketing center.

The State Forest Department has developed plantations of quick growing *Eucalyptus* hybrids in the drier areas. *Anogeissus latifolia* (DC.) Bedd., *Dalbergia paniculata* Roxb., *Pterocarpus marsupium* Roxb., *Santalum album* L. and *Shorea roxburghii* G. Don are some of the local trees that are being propagated by foresters.

The *malnad* is a planters' paradise. The entire upper Ghat region from Chikkanahalli in the North to Uchangi in the South is the home of coffee, cardamum, pepper, orange and tea. *Coffea arabica* L., *C. robusta* Linden ex de Wildem. and *C. liberica* Bull ex Hiern have formed the basis of innumerable 'selections' cultivated on the well-drained slopes

of the upper Ghats. *Erythrina* and *Grevillea* are the common shade trees. The production of coffee in 1967-68 was 6,900 tonnes. *Elettaria cardamomum* (L.) Mat. especially its 'Manjarabad' variety has been cultivated in the wetter forest lands. However, the acreage under cardamum has been decreasing mainly due to the incidence of the '*Katte*' virus disease. Efforts are being made to introduce resistant strains by offering attractive subsidies to the cultivators. Pepper is grown as a mixed crop with coffee and cardamum. The production in 1969 was 667 tons (cf. Abishankar, *Mysore State Gazeteer—Hassan District.* 1971). Rice is another important crop in the *malnad* and is confined to the narrow terraced valleys as well as to the irrigated banks of the Hemavathy.

The Forest Department has generally leased out the State reserves for selective felling to private contractors. Working plans of these forests are available with the Forest Department as well as with the contractors. Stricter controls seem to be called for to ensure a rational exploitation of the forests. The Bamboos which flowered during Meebold's visit in 1908 once again flowered in 1967-68. Large areas of bamboo forest have been cleared and planted with quick growing soft-woods.

The opening up of the forest valleys for the construction of Hassan-Mangalore Railway has had a damaging effect on these forests and may lead to their rapid degeneration. As these forests constitute the water shed for the West-coast rivers, their indiscriminate destruction is bound to lead to serious erosion, silting of river beds and flash floods during the monsoon period.

Classification and format

Most Indian floristic works have been based on the Bentham and Hooker system of classification or on slight modifications of it. However, the rapid progress in taxonomic studies has given rise to several systems that take into account these recent developments. Of late there has been a broad consensus among systematists in this field. A. Cronquist, A. Takhtajan (*Flowering Plants, Origin and Dispersal.* 1969) and R. Thorne (ALISO 6(4): 57-66. 1968) have more that brings them together rather than separates them. While not proposing a system of its own, this flora follows the lines proposed by Dr. A. Cronquist for the angiosperms in '*The Evolution and Classification of Flowering Plants*' (1968). K. Becker (*Taxon* 22: 19-50. 1973) has given a tabular comparison of some of the important systems in relation to Cronquist's classification.

The Dicotyledons of earlier authors are called class Magnoliopsida and subdivided into 6 subclasses. There is a thorough reshuffling of families in the Dicots and Gamble's 4 divisions of Thalamiflorae, Calyciflorae, Corolliflorae and Monochlamydeae are given up. The monocots,

termed class Liliopsida, are broken up into 4 subclasses. Here also the sequence of the families is changed and the circumscription of some of them greatly altered. The following table shows some significant changes regarding the circumscription of families in the two systems insofar as they occur in Hassan District:

	Cronquist	*Gamble*
1.	Nelumbonaceae	Included in Nymphaeaceae
2.	Moraceae (excludes Cannabaceae)	Moraceae (includes Cannabaceae)
3.	Clusiaceae (Guttiferae)	Hypericaceae & Guttiferae
4.	Flacourtiaceae	Comprising of Flacourtiaceae, Samydaceae & Bixaceae *ex parte*
5.	Ericaceae	Ericaceae & Vacciniaceae
6.	Leeaceae	Included in Vitaceae
7.	Oxalidaceae Balsaminaceae	Included in Geraniaceae
8.	Menyanthaceae	Included in Gentianaceae
9.	Buddlejaceae	Included in Loganiaceae
10.	Liliaceae	Liliaceae *ex parte* Amaryllidaceae Haemodoraceae *ex parte*
11.	Agavaceae	Included in Amaryllidaceae & Liliaceae
12.	Smilacaceae	Included in Liliaceae

The genera within families and species within genera are arranged in simple alphabetical sequence. The keys are so constructed as to allow as easy as possible an identification of the plants of Hassan District than to represent any putative evolutionary sequence.

Correct nomenclature is a worthy goal which we have sought. Indian botany is particularly beset with nomenclature problems. One problem is the past acceptance of *nomina nuda* first appearing in lists such as Roxburgh's *Hortus Bengalensis,* Wallich's *A Numerical List of dried plants* and to a certain extent in Graham's *Catalogue of Plants Growing in Bombay.* These invalidly published names are often validated by later authors but by whom and where are very difficult problems. Until the place and date of first valid publication of *nomina nuda* is ascertained it is difficult to determine priority of publication. A second nomenclatural difficulty is use of priorable names instead of the "Kew Rule" as used in the earlier Indian floras. Fortunately most of this job has been done by recent workers. The last nomenclatural area we have noticed needing attention is the correct use of connecting vowels in compound words. There are two

common misuses in forming compounds using genitive singular, e.g., *lanceaefolia=lancifolia, cannaecarpa=cannicarpa, tiliaefolia=tiliifolia* and using an unadorned stem, e.g., *delphinifolia=delphiniifolia, nummularifolia=nummulariifolia* and *salvifolia=salviifolia.*

The valid name is followed by the basionym and some of the synonyms commonly used in India arranged in chronological order. A reference to Gamble as well as to an authoritative monograph is given wherever possible. Abbreviations of periodicals is according to the B. P. H. (*Botanico-Periodicum-Huntianum* 1968. Pittsburgh).

The general distribution of a taxon is given first. Then the frequency, environment and habitat in Hassan District. For habitat we have recognized two major floristic divisions, the Ghats and the plains. The Ghats are arbitrarily divided into upper and lower with an undefinable middle area. Most collections from lower Ghats come from the Bisle (south side) or Shiradi (central) Ghats. The upper ghats more or less end with the Hemavathy River. The plains are east of the Hemavathy and we sometimes find it useful to divide them into the eastern (east of Hassan) and western plains. We also regard the hills of the plains as another unit. Essentially we find four areas: lower Ghats, upper Ghats up to Hemavathy, plains (rolling area east of Hemavathy River) and hills (arising from plains).

Flowering and fruiting time commonly appears as months such as "June-September." This means flowering around June and fruits ripening by September. Flowering is commonly associated with a season and the reader is advised to study the section on climate to learn that the hot, dry season is from March to June, etc.

Notes have not been minimized and under them reasonings, observations and problems are mentioned.

Several of the plants have already been illustrated in the classical works on Indian Botany, particularly those by Wight and Beddome. It was, therefore, considered more appropriate to prepare, wherever possible, composite family illustrations based on actual specimens collected in Hassan District. A band of three botanists with artistic talent, Shrimathi M. Vijayalaxmi, Kumari T. Gowri and Shri G. Rajasekhar have drawn these based on their own dissections. The plate on Cyperaceae was drawn by Miss Victoria Gordon at Kew.

Key to Groups of Seed Plants from Hassan District

Dan H. Nicolson

1 Seeds and ovules borne on surface of megasporophylls; stigma none.....Group 1
1 Seeds and ovules enclosed in megasporophyll (carpel); stigma present.
 2 Stem without central pith, woody substance in scattered bundles, outer rind firmly attached; flowers usually 3-merous; venation usually striate; cotyledon 1.....Group 2
 2 Stem with central pith and/or surrounded by concentric rings of woody tissue, bark separable; flowers usually 4-5-merous; venation usually reticulate; cotyledons usually 2.
  3 Perianth absent (achlamydeous) or uniseriate (monochlamydeous).....Group 3
  3 Perianth biseriate or multiseriate.
   4 Petals all united, at least at base.....Group 4
   4 Petals free or only some united.
    5 Ovary inferior or half-inferior.....Group 5
    5 Ovary superior.
     6 Stamens more than twice as many as petals.....Group 6
     6 Stamens twice as many as petals or fewer.....Group 7

Group 1. GYMNOSPERMS

1 Leaves alternate, pinnate and palmlike; male gametes motile.....1 **Cycadaceae**
1 Leaves opposite, simple; male gametes not motile.....2 **Gnetaceae**

Group 2. MONOCOTS

1 Perianth not petaloid, reduced to scales or bristles, or absent.
 2 Plants woody.
  3 Leaves pinnately or palmately divided.....146 **Arecaceae**
  3 Leaves entire.
   4 Leaves spiralled, armed.....147 **Pandanaceae**
   4 Leaves 2-ranked, unarmed.....139 **Poaceae**
 2 Plants herbaceous.
  5 Plants minute, thalloid.....149 **Lemnaceae**
  5 Plants with differentiated leaves.

6 Inflorescence of heads or spikelets of florets in the axils of glumaceous bracts.
7 Inflorescence a solitary head on spirally ribbed peduncle....136 **Eriocaulaceae**
7 Inflorescence various but not as above.
8 Style very short. Ovules many.....137 **Juncaceae**
8 Style elongate. Ovules solitary.
9 Style 1; seed 2-3-angled.....138 **Cyperaceae**
9 Styles 2 (1 in cult. *Zea*); seed rounded.....139 **Poaceae**
6 Inflorescence not in heads nor in glumaceous spikelets.
10 Flowers solitary.
11 Leaves denticulate, auriculately sheathing at base.....132 **Najadaceae**
11 Leaves entire, sheath not auriculate or none.....130 **Hydrocharitaceae**
10 Flowers in a spike.
12 Flowers scattered on spike.....133 **Potamogetonaceae**
12 Flowers densely packed on spike.
13 Flowers and fruits (inflorescence) densely pappose and drying.....
.....140 **Typhaceae**
13 Flowers and fruits (inflorescence) glabrous and fleshy.....148 **Araceae**
1 Perianth petaloid, at least in part.
14 Flowers staminate.
15 Plants climbing, often woody.
16 Inflorescence an umbel; tendriliferous or clambering.....154 **Smilacaceae**
16 Inflorescence various but not umbellate; twining.....155 **Dioscoreaceae**
15 Plants not climbing, strictly herbaceous.
17 Plants of dry land; leaves over 2 m long.....141 **Musaceae**
17 Plants aquatic, leaves less than 1 m long.
18 Stamens 3 or less.....130 **Hydrocharitaceae**
18 Stamens 6 or more.....129 **Alismataceae**
14 Flowers pistillate or bisexual.
19 Pistils 3 or more.
20 Perianth uniseriate, 1-3, usually 2, all petaloid.....131 **Aponogetonaceae**
20 Perianth biseriate, 3 sepaloid, 3 petaloid.....129 **Alismataceae**
19 Pistil solitary.
21 Ovary superior.
22 Perianth with 3 petaloid parts.
23 Inflorescence a bracteate head.....134 **Xyridaceae**
23 Inflorescence various but never a head.....135 **Commelinaceae**
22 Perianth of 6 petaloid parts.
24 Plants aquatic.....150 **Pontederiaceae**
24 Plants of dry land.
25 Plants herbaceous; leaves succulent or membranous.....151 **Liliaceae**
25 Plants woody; leaves coriaceous.
26 Plants climbing; venation reticulate.....154 **Smilacaceae**
26 Plants not climbing; venation striate.....153 **Agavaceae**
21 Ovary inferior.
27 Plants aquatic.....130 **Hydrocharitaceae**
27 Plants of dry land.
28 Plants climbing.....155 **Dioscoreaceae**
28 Plants not climbing.
29 Leaves armed at least with prickle at tip.....153 **Agavaceae**
29 Leaves unarmed.
30 Perianth tubular, split on one side; leaves over 2 m long.....141 **Musaceae**

30 Perianth parts variously united but not in a split tube; leaves less than 1 m long.
31 Fertile stamens 3 or 6; flowers regular.
32 Fertile stamens 6.....151 **Liliaceae**
32 Fertile stamens 3.
33 Plants scapose, often leafless.....156 **Burmanniaceae**
33 Plants leafy.....152 **Iridaceae**
31 Fertile stamens 1(2); flowers irregular.
34 Staminodia not petaloid; stamen and style united in a column.....157 **Orchidaceae**
34 Staminodia petaloid; stamen and style separate.
35 Petiole pulvinate at juncture with blade; ovules 1 per locule.....145 **Marantaceae**
35 Petiole not pulvinate; ovules many per locule.
36 Top of petiolar sheath not free from petiole; fruit warty; anther 1-celled, on and overtopped by petaloid structure.....144 **Cannaceae**
36 Top of petiolar sheath free (ligulate); fruit smooth or winged; anther 2-celled on free filament.
37 Aerial stem straight. Leaves 2-ranked; sheaths open.....142 **Zingiberaceae**
37 Aerial stem twisting. Leaves spirally arranged; sheaths closed.....143 **Costaceae**

Group 3. ACHLAMYDEOUS AND MONOCHLAMYDEOUS DICOTS
(Except *Cissampelos*)

1 Plants submerged.
2 Plants attached to rocks in streams; thalloid.....63 **Podostemaceae**
2 Plants free-floating; leaves differentiated.....11 **Ceratophyllaceae**
1 Plants not submerged.
3 Plants fleshy, scaly root parasites without chlorophyll.....80 **Balanophoraceae**
3 Plants not as above.
4 Perianth none.
5 Flowers in cyathia: a naked female flower surrounded by several male flowers, each of a single jointed stamen—the whole cluster subtended by often sepaloid or petaloid involucral bracts and forming a bisexual pseudoflower.....86 **Euphorbiaceae**
5 Flowers in spikes.
6 Trees; fruit a capsule.....49 **Salicaceae**
6 Herbs or shrubs; fruit a berry or nutlet.....7 **Piperaceae**
4 Perianth present.
7 Ovary inferior or apparently so, being tightly invested by persistent hypanthium.
8 Plants herbaceous, not scandent.
9 Leaves alternate; flowers unisexual; ovary truly inferior.....47 **Begoniaceae**
9 Leaves opposite; flowers bisexual; ovary only appearing to be inferior.
10 Leaves subsessile; perianth calycine.....65 **Lythraceae** (*Ammania*)
10 Leaves petiolate; perianth corolline.....19 **Nyctaginaceae**
8 Plants woody; climbers sometimes subherbaceous.
11 Plants stem parasites.....79 **Loranthaceae**
11 Plants not parasitic or root parasites.
12 Foliage and shoots scurfy with peltate or stellate scales; ovary only appearing to be inferior.....72 **Elaeagnaceae**

12 Foliage and shoots not scurfy; ovary truly inferior.
13 Ovary 4-6-locular; ovules many; perianth 2-3-lobed; stamens 6 or more ..... 8 **Aristolochiaceae**
13 Ovary 1-locular; ovules 1-3; perianth 4-5-lobed (when 3-lobed then stamens 3).
14 Stamens 10, twice as many as calyx lobes ..... 71 **Combretaceae**
14 Stamens 3-5, as many as calyx lobes ..... 78 **Santalaceae**
7 Ovary superior.
15 Anthers opening by 2 or 4 upcurled lids ..... 6 **Lauraceae**
15 Anthers not dehiscing by lids.
16 Pistils 2 or more (carpels free).
17 Trees ..... 37 **Sterculiaceae**
17 Herbs or if shrubby then climbing.
18 Flowers unisexual; perianth calycine ..... 13 **Menispermaceae** (*Anamirta*)
18 Flowers bisexual; perianth petaloid ..... 12 **Ranunculaceae**
16 Pistil solitary (carpels 1 or united).
19 Ovary 2-5-locular.
20 Ovules many per locule; herbs ..... 22 **Molluginaceae**
20 Ovules 1-3 per locule.
21 Ovules axile ..... 86 **Euphorbiaceae**
21 Ovules all or mostly basal.
22 Herbs; capsule circumscissile ..... 21 **Aizoaceae**
22 Woody; fruit not circumscissile.
23 Plants armed; leaves simple, triplinerved ..... 87 **Rhamnaceae** (*Ziziphus*)
23 Plants unarmed; leaves compound or if simple then not triplinerved ..... 92 **Sapindaceae**
19 Ovary 1-locular.
24 Plants twining (single petal in female flower; corolline cupule in male) ..... 45 **Menispermaceae** (*Cissampelos*)
24 Plants not twining.
25 Herbs.
26 Stipules ochreate ..... 27 **Polygonaceae**
26 Stipules absent or not ochreate.
27 Perianth and bracts scarious; stamens often connate below ..... 26 **Amaranthaceae**
27 Perianth and bracts not scarious; stamens free.
28 Flowers unisexual; style undivided; leaves triplinerved ..... 18 **Urticaceae**
28 Flowers bisexual; style 2-more-branched; leaves pinnately veined ..... 25 **Chenopodiaceae**
25 Woody plants.
29 Leaves compound ..... 62 **Fabaceae**
29 Leaves simple.
30 Stipules present.
31 Style branched.
32 Anthers inflexed and reversed in bud; ovule 1, apical ..... 17 **Moraceae**
32 Anthers erect in bud.
33 Ovule solitary, apical ..... 16 **Ulmaceae**
33 Ovules 2, basal ..... 86 **Euphorbiaceae** (*Antidesma*)
31 Style undivided.
34 Placentation parietal ..... 42 **Flacourtiaceae** (*Casearia*)
34 Placentation not so.
35 Ovule apical ..... 17 **Moraceae**
35 Ovule basal ..... 18 **Urticaceae**

30 Stipules none.
36 Styles 5.....42 **Flacourtiaceae** (*Flacourtia*)
36 Style 1.
37 Perianth calycine; flowers unisexual.....5 **Myristicaceae**
37 Perianth corolline; flowers bisexual.
38 Trees; tepals free.
39 Stamens 4.....73 **Proteaceae**
39 Stamens many.....34 **Clusiaceae** (*Calophyllum*)
38 Shrubs, erect or scandent.
40 Erect shrubs; inflorescence many-flowered, capitate.....66 **Thymelaeaceae**
40 Climbing shrubs; inflorescence few-flowered, spicate or fasciculate.....
.....,.....77 **Opiliaceae**

Group 4. SYNPETALOID DICOTS

1 Stamens more than corolla lobes.
2 Ovary inferior.
3 Stamens 10; ovary 5-locular.....52 **Ericaceae**
3 Stamens many; ovary 1-locular.....20 **Cactaceae**
2 Ovary superior.
4 Leaves opposite, succulent; pistils 4.....59 **Crassulaceae**
4 Leaves alternate, coriaceous; pistil 1.
5 Leaves compound.....62 **Fabaceae**
5 Leaves simple.
6 Corolla urceolate; flowers usually unisexual.....54 **Ebenaceae**
6 Corolla rotate to campanulate; flowers bisexual.
7 Styles or stigmas 3; plants glabrous; sap clear.....32 **Theaceae**
7 Style and stigma 1; plants pubescent with usually centrifixed hairs; sap often milky.....53 **Sapotaceae**
1 Stamens as many as petals or fewer.
8 Ovary partly or wholly inferior.
9 Tendril-bearing vines.....48 **Cucurbitaceae**
9 Plants not tendriliferous.
10 Anthers united around style (syngenesious).
11 Flowers in involucrate heads; ovary 1-locular.....128 **Asteraceae**
11 Flowers not in heads; ovary 2-more-locular.....125 **Campanulaceae**
10 Anthers free.
12 Leaves opposite.
13 Stipules conspicuous, sometimes leaflike and then leaves apparently whorled .....126 **Rubiaceae**
13 Stipules none or reduced to a rim.....127 **Caprifoliaceae**
12 Leaves alternate.
14 Woody; stamens opposite the petals.....56 **Myrsinaceae** (*Maesa*)
14 Herbs; stamens alternate with the petals.....125 **Campanulaceae**
8 Ovary superior.
15 Stamens opposite the petals.
16 Ovary 2-many-locular; placentation axile.
17 Leaves compound; stamens united by filaments .....88 **Leeaceae**
17 Leaves simple; stamens free from each other.
18 Corolla urceolate; stamens free from petals; flowers usually unisexual.....
.....54 **Ebenaceae**

18 Corolla rotate; stamens epipetalous; flowers bisexual.....53 **Sapotaceae**
16 Ovary 1-locular; placentation free-central.
19 Styles 5; flowers long-tubular; calyx with stalked glands.....28 **Plumbaginaceae**
19 Style 1; flowers rotate; calyx not glandular.
20 Herbs; leaves usually opposite; perianth not gland-dotted, fruit circumscissile ..... 57 **Primulaceae**
20 Shrubs; leaves alternate; perianth gland-dotted; fruit fleshy:....56 **Myrsinaceae**
15 Stamens alternate with the petals.
21 Corolla irregular; stamens 4 or 2.
22 Fruit elastically dehiscent; seeds often on upcurved processes; inflorescence usually with conspicuous bracts.....122 **Acanthaceae**
22 Not as above.
23 Ovules and seeds few.
24 Ovary 4-lobed; style arising from between the lobes of the ovary..... .....115 **Lamiaceae**
24 Ovary entire; style apical.
25 Plants viscid-pubescent.....123 **Pedaliaceae**
25 Plants not viscid-pubescent.....114 **Verbenaceae**
23 Ovules and seeds many.
26 Leaves compound; seeds winged.....121 **Bignoniaceae**
26 Leaves simple; seeds not winged.
27 Placentation free-central; plants aquatic or of wet places, typically with small insectivorous bladders.....124 **Lentibulariaceae**
27 Placentation parietal or axile; plants not insectivorous.
28 Placentation axillary, solid and unbranched.....118 **Scrophulariaceae**
28 Placentation parietal, often intruded and meeting below middle of locule but branched or winged.
29 Leafless parasitic herbs without chlorophyll.....120 **Orobanchaceae**
29 Leafy herbs with chlorophyll.
30 Perianth 4-5-merous; corolla contorted.....107 **Gentianaceae**
30 Perianth 5-merous; corolla imbricate or valvate.....119 **Gesneriaceae**
21 Corolla regular, stamens usually 5.
31 Leaves alternate.
32 Ovules and seeds many.
33 Plants aquatic; placentation parietal.....112 **Menyanthaceae**
33 Plants terrestrial; placentation axile.....110 **Solanaceae**
32 Ovules and seeds few.
34 Ovary 1-locular; corolla valvate; fruit drupaceous, 1-seeded....84 **Icacinaceae**
34 Ovary 2-4-locular; corolla imbricate or plicate; fruit capsular, of 4 nutlets, or if drupaceous then with 1-4-locular pyrene.
35 Fruit capsular; corolla usually plicate; plants usually climbing..... .....111 **Convolvulaceae**
35 Fruit dry with 4 nutlets or drupaceous with 1-4-locular pyrene..... .....113 **Boraginaceae**
31 Leaves opposite.
36 Stamens 2, fewer than corolla lobes.....117 **Oleaceae**
36 Stamens 4 or more, as many as the corolla lobes.
37 Carpels free at base; sap usually milky.
38 Carpels united only at stigmatic disk; pollen aggregated into masses which are connected in pairs to stigmatic glands.....109 **Asclepiadaceae**
38 Pollen not aggregated into pollinia; carpels united by styles..108 **Apocynaceae**

37 Carpels entirely united.
39 Sap milky.....108 **Apocynaceae**
39 Sap clear.
40 Herbs.
41 Plants hispid; ovary 4-locular, 4-ovuled.....113 **Boraginaceae** (*Trichodesma*)
41 Plants glabrous; ovary 1-locular, many ovulate.....107 **Gentianaceae**
40 Woody plants.
42 Ovules pendulous; seed or pyrene solitary, fruit drupaceous with persistent calyx.....114 **Verbenaceae**
42 Ovules axile; seeds 2 or more.
43 Petals shortly connate at base.....82 **Celastraceae** (*Microtropis*)
43 Petals united to more than half their length.
44 Fruit a capsule.....116 **Buddlejaceae**
44 Fruit a berry, often crustose.....106 **Loganiaceae**

Group 5. POLYPETALOID DICOTS WITH INFERIOR OVARY

1 Stamens many, more than twice as many as petals.
2 Aquatic plants.....9 **Nymphaeaceae**
2 Terrestrial plants.
3 Styles more than 1; flower unisexual.....47 **Begoniaceae**
3 Style 1; flower bisexual.
4 Petals many; plants armed, succulent, virtually leafless.....20 **Cactaceae**
4 Petals few; plants unarmed, woody, leafy.
5 Leaves opposite, gland-dotted.....68 **Myrtaceae**
5 Leaves alternate, not gland-dotted.
6 Fruit woody, operculate; stamens and petals over 4 cm long.....40 **Lecythidaceae**
6 Fruit drupaceous; stamens and petals less than 2 cm long....55 **Symplocaceae**
1 Stamens few, twice as many as petals or fewer.
7 Styles more than 1.
8 Aquatic plants; leaves whorled below.....64 **Haloragaceae**
8 Terrestrial plants; leaves all alternate.
9 Herbs; fruit of two mericarps.....105 **Apiaceae**
9 Woody plants; fruit drupaceous or capsular.
10 Leaves palmately compound.....104 **Araliaceae**
10 Leaves simple.
11 Stamens opposite petals.
12 Locules 3, ovule 1 per locule; plants climbing.....87 **Rhamnaceae** (*Gouania*)
12 Locule 1, ovules many; trees.....42 **Flacourtiaceae** (*Homalium*)
11 Stamens alternate with petals or more than petals.
13 Climber by hooks; petiole without stipular spurs....46 **Ancistrocladaceae**
13 Trees; petiole with stipular spurs.....94 **Anacardiaceae** (*Holigarna*)
7 Style 1.
14 Herbs.
15 Floating aquatic plants.....67 **Trapaceae**
15 Terrestrial plants.
16 Leaves cauline, alternate; venation pinnate; anthers longitudinally dehiscent.....69 **Onagraceae**
16 Leaves basal or opposite; venation palmate; anthers poricidal.....70 **Melastomataceae**

14 Woody plants.
17 Stamens 4-5, as many as petals.
18 Climber; venation palmate.....76 **Olacaceae** (*Erythropalum*)
18 Tree; venation pinnate.....75 **Cornaceae**
17 Stamens 8 or more, twice as many as petals.
19 Leaves 3-5-palmately veined; anthers poricidal.....70 **Melastomataceae**
19 Leaves pinnately veined; anthers longitudinally dehiscent.
20 Stigma 3-4-lobed.....74 **Rhizophoraceae**
20 Stigma simple.
21 Berry globose; inflorescence fasciculate.....70 **Melastomataceae** (*Memecylon*)
21 Fruit 4-winged; inflorescence spicate.....71 **Combretaceae** (*Combretum*)

Group 6. POLYPETALOID DICOTS WITH SUPERIOR OVARY AND MANY STAMENS

1 Aquatic plants.....10 **Nelumbonaceae**
1 Terrestrial plants.
2 Pistils more than 1.
3 Stamens united by filaments (monadelphous).....39 **Malvaceae**
3 Stamens free from each other.
4 Stamens arising from hypanthium (perigynous).....61 **Rosaceae**
4 Stamens arising from receptacle (hypogynous).
5 Perianth multiseriate.....3 **Magnoliaceae**
5 Perianth 2-3-seriate.
6 Perianth 2-seriate, 5-merous; sepals persistent, imbricate.....29 **Dilleniaceae**
6 Perianth 3-seriate, 3-merous; sepals deciduous, valvate.....4 **Annonaceae**
2 Pistil 1.
7 Stamens arising from hypanthium (perigynous).
8 Leaves opposite; fruit a capsule.....65 **Lythraceae**
8 Leaves alternate; fruit a drupe.....61 **Rosaceae** (*Prunus*)
7 Stamens arising from receptacle (hypogynous).
9 Leaves opposite.....34 **Clusiaceae**
9 Leaves alternate.
10 Stamens united by filaments (monadelphous).
11 Leaves digitately compound.....38 **Bombacaceae**
11 Leaves simple.....39 **Malvaceae**
10 Stamens free or in phalanges (polyadelphous).
12 Ovary stipitate (on gynophore).
13 Stamens in 5 phalanges of 3 stamens each; venation palmate.....37 **Sterculiaceae**
13 Stamens free; venation pinnate.....50 **Capparaceae**
12 Ovary sessile.
14 Flowers unisexual.
15 Ovules 1-2 per locule.....86 **Euphorbiaceae**
15 Ovules many per locule.....32 **Theaceae** (*Eurya*)
14 Flowers bisexual.
16 Venation palmate.
17 Flowers axillary; placentation axile.....36 **Tiliaceae**
17 Flowers terminal; placentation parietal.....45 **Bixaceae**
16 Venation pinnate.
18 Sepals 2, caducous; leaves lacerate; herbs.....15 **Papaveraceae**

18 Sepals 5, persistent-deciduous; leaves entire-serrate; woody.
19 Leaves gland-dotted, 3-foliolate.....95 **Rutaceae** (*Aegle*)
19 Leaves not gland-dotted, simple.
20 Anthers poricidal.
21 Petals laciniate; sepals deciduous; style terminal.....35 **Elaeocarpaceae**
21 Petals entire; sepals accrescent; style gynobasic.....30 **Ochnaceae**
20 Anthers dehiscing by longitudinal slits.
22 Stipules none; ovules many, axillary.....32 **Theaceae**
22 Stipules present; ovules few, parietal.....31 **Dipterocarpaceae**

Group 7. POLYPETALOID DICOTS WITH SUPERIOR OVARY AND FEW STAMENS

1 Gynoecium 1-locular.
2 Leaves compound.
3 Styles 3-4; ovule 1, basal.....94 **Anacardiaceae**
3 Style 1, ovules usually 2 or more.
4 Stipules present; ovules marginal, usually more than 2.....62 **Fabaceae**
4 Stipules 0; ovules basal, 2.....91 **Connaraceae** (*Connarus*)
2 Leaves simple.
5 Ovules 1-2; placentation apical, basal or marginal.
6 Flowers 3-merous, unisexual; climbers.....13 **Menispermaceae**
6 Flowers 4-5-merous.
7 Stamens unequal; ovule 1, subbasal; sap acrid....94 **Anacardiaceae** (*Anacardium*)
7 Stamens equal; ovules 2, pendulous; sap not acrid.....84 **Icacinaceae**
5 Ovules 3-many.
8 Placentation free-central.
9 Stamens alternate with petals.....23 **Caryophyllaceae**
9 Stamens opposite petals.
10 Plants woody; leaves alternate, gland-dotted.....56 **Myrsinaceae** (*Embelia*)
10 Herbs; leaves opposite, not gland-dotted.....57 **Primulaceae**
8 Placentation parietal or marginal.
11 Ovules marginal, on 1 ventral placenta.....62 **Fabaceae**
11 Ovules parietal, on 2 or more placentas.
12 Plants insectivorous, covered with glandular hairs.....41 **Droseraceae**
12 Plants not insectivorous nor covered with glandular hairs.
13 Plants with tendrils; leaves cordate.....44 **Passifloraceae**
13 Plants not climbing; leaves cuneate.
14 Ovary on elongate gynophore.....50 **Capparaceae**
14 Ovary subsessile.
15 Anther connectives produced beyond cells.....43 **Violaceae**
15 Anther connectives not produced.
16 Flowers bisexual; placentas intrusive; seeds imbedded in resinous pulp of placenta.....58 **Pittosporaceae**
16 Flowers often unisexual; placentas not intrusive; seeds not imbedded in pulp.....42 **Flacourtiaceae**
1 Gynoecium 2-more-locular.
17 Herbs.
18 Stamens tetradynamous, 4 long and 2 short.....51 **Brassicaceae**
18 Stamens not tetradynamous.
19 Leaves compound.

20 Climber; leaves biternately compound.....92 **Sapindaceae** (*Cardiospermum*)
20 Erect; leaves ternately or pinnately compound.
21 Leaves opposite.....97 **Zygophyllaceae**
21 Leaves alternate.....98 **Oxalidaceae**
19 Leaves simple.
22 Flowers irregular.
23 Anthers sessile; ovary 5-locular, ovules many.....99 **Balsaminaceae**
23 Anthers on split sheath; ovary 2-locular, ovule 1 per locule.....
.....103 **Polygalaceae**
22 Flowers regular.
24 Leaves opposite.
25 Style 1; ovules free-central.....65 **Lythraceae**
25 Styles 2-5; ovules axile.....32 **Elatinaceae**
24 Leaves alternate.
26 Flowers unisexual.
27 Pistil 1.....86 **Euphorbiaceae**
27 Pistils 3-6.....13 **Menispermaceae** (*Cocculus*)
26 Flowers bisexual.
28 Plants glabrous.....101 **Linaceae**
28 Plants pubescent.....37 **Sterculiaceae**
17 Woody plants.
29 Leaves opposite.
30 Leaves compound.....90 **Staphyleaceae**
30 Leaves simple.
31 Stamens 2-3.
32 Stamens 3; perianth 5-merous.....81 **Hippocrateaceae**
32 Stamens 2; perianth 4-merous.....117 **Oleaceae**
31 Stamens 4-5 or 10.
33 Stamens opposite petals.....87 **Rhamnaceae** (*Sageretia*)
33 Stamens alternate with petals or twice as many.
34 Plants armed with stipular spines.....83 **Salvadoraceae**
34 Plants unarmed.
35 Stamens 10; disc obscure.....102 **Malpighiaceae**
35 Stamens 4-5; disc prominent.....82 **Celastraceae**
29 Leaves alternate.
36 Stamens as many as and opposite petals or fewer.
37 Pistils 3.....13 **Menispermaceae** (*Diploclisia*)
37 Pistil 1.
38 Fertile stamens 2 or 3; placentation axile or apical.
39 Fertile stamens 2, opposite and adnate to 2 small bifid petals; staminodes 3, broad and opposite 3 orbicular petals; ovules pendulous.....
.....14 **Sabiaceae**
39 Fertile stamens 3; petals 3 and elongate but 2 deeply bifid and flower appearing to have 5 petals.....76 **Olacaceae** (*Olax*)
38 Fertile stamens 4 or 5; placentation basal.
40 Style short or none; plants tendriliferous; leaves compound or cordate; petals thickened at apex.....89 **Vitaceae**
40 Styles as many as locules, conspicuous; etendriliferous; leaves simple but never cordate.....87 **Rhamnaceae**
36 Stamens as many as and alternate with petals or twice as many as petals.
41 Leaves pellucidly glandular-punctate.....95 **Rutaceae**

41 Leaves not pellucid-punctate.
42 Leaves compound.
43 Pistils 5, free.....91 **Connaraceae** (*Rourea*)
43 Pistil 1, carpels united.
44 Disc extrastaminal; flower often irregular.....92 **Sapindaceae**
44 Disc intrastaminal; flower regular.
45 Ovule 1 per locule, pendulous.....94 **Anacardiaceae** (*Spondias*)
45 Ovules 2 per locule, axile.
46 Filaments of stamens bifid at anther, often united beyond anthers.....96 **Meliaceae**
46 Filaments of stamens not bifid, never united upto anthers.
47 Stamens as many as petals.....96 **Meliaceae** (*Toona*)
47 Stamens twice as many as petals.....93 **Burseraceae**
42 Leaves simple.
48 Flowers unisexual.
49 Flowers staminate or bisexual; ovules basal, 2 per locule.....82 **Celastraceae**
49 Flowers strictly unisexual.
50 Ovule pendulous, 1 per locule; petals bifid.....85 **Dichapetalaceae**
50 Ovules axile, 1 or 2 per locule; petals not bifid.....86 **Euphorbiaceae**
48 Flowers bisexual.
51 Venation palmate.
52 Stamens united below.....37 **Sterculiaceae**
52 Stamens free.....36 **Tiliaceae** (*Triumfetta*)
51 Venation pinnate.
53 Stamens as many as petals.....82 **Celastraceae**
53 Stamens twice as many as petals.
54 Plants armed; petals not clawed, hairy inside, eligulate.....76 **Olacaceae** (*Ximenia*)
54 Plants unarmed; petals clawed, glabrous, with emarginate ligule at apex of claw.....100 **Erythroxylaceae**

Descriptions of Families

1. CYCADACEAE

K. N. Gandhi

CYCAS Linnaeus

Trees or shrubs, dioecious. Leaves spirally arranged, clustered at apices of trunks, frequently alternating with scales; base persistent; blade pinnate; leaflets numerous, sessile, entire, with a prominent midrib, coriaceous, lower ones often reduced to spines. Inflorescence terminal. Male inflorescence an erect, short-peduncled cone, formed of many, thickened, flat, closely imbricate scales (microsporophylls) bearing numerous, ellipsoid, 1-celled microsporangia; microsporangia crowded in groups of 3-5. Female inflorescence with several megasporophylls which are initially appressed into a cone, finally spreading; stalks narrow, apically produced into an entire to pectinate, densely tomentose blade (apophysis); ovules 1-4 in the notches on either side of the axis below the blade, large, with a single integument, naked. Seeds drupaceous, sessile, ellipsoid or globose, endospermous.

Cycas circinalis L., Sp. Pl. 1188. 1753; Gamble, Fl. Madras 1394 (975). 1928; Raizada & Sahni, Indian Forest Rec., Bot. 5: 95. 1958.

Palm-like trees. Petioles spiny; leaflets flat. Microsporophylls obovate, acuminate, upturned; apophysis of megasporophylls broader than ovule-bearing portion, ovate-rhomboid, deeply dentate along margin, acuminate-subcaudate at apex.

S. India, Sri Lanka. Locally common trees at Nagpuri (scrub). All seasons. *CJS* 15197, *HFP* 2687.

2. GNETACEAE

K. N. Gandhi

GNETUM Linnaeus

Trees, shrubs or woody climbers, usually dioecious; branches jointed at nodes. Leaves opposite; stipules 0; blade simple, entire, penninerved, rarely reduced to scales. Inflorescence spicate, axillary or cauline, simple or branched, 2-bracteate at the tip of peduncle, with many, superposed, cupular collars (connate bracts) containing unisexual, sessile flowers mixed with numerous, jointed hairs. Staminate spike: collars closely arranged, with several, spirally arranged staminate flowers below a ring of sterile pistillate flowers; stamens (microsporophylls) solitary, surrounded by a funnel-shaped, entire or 2-4-lobed pseudoperianth (connate bracteoles); anthers (microsporangia) usually 2, sessile, dehiscing terminally. Pistillate inflorescence: collars lax, with a ring of few, mostly fertile pistillate flowers composed of a large ovule surrounded by an outer fleshy envelope and 2 inner, thinner ones (integuments), the innermost one produced into a narrow micropylar tube; sterile ovules with only 2 envelopes. Seeds endospermous, enclosed by outer fleshy, middle stony and inner membranous envelopes forming a pseudofruit.

Gnetum ula Brongn. in Duperrey, Voy. Coquille 7: 12. 1829; Gamble, Fl. Madras 1885(1304). 1936; Sant., Fl. Khandala ed. 3, 261. 1967. *Gnetum funiculare* Smith ex Wight, Ic. t. 1955. 1853, non Brongn. 1829.

Large climbers with elliptic-ovate, acute, coriaceous leaves. Pseudofruits stalked, with scattered silvery scales, acute.

South India. Occasional robust lianas in upper Ghats, on forest trees. January-May. *CJS* 16404, *HFP* 1345. (Plate 1).

3. MAGNOLIACEAE

K. N. Gandhi

MICHELIA Linnaeus

Woody. Leaves alternate; stipules amplexicaul, caducous, leaving a scar encircling stem; blade simple, usually entire; venation pinnate. Flowers generally solitary, axillary, bisexual, regular; peduncle with 1-2 foliaceous, deciduous bracts. Perianth of many, free, petaloid segments, in 2-many series, deciduous. Receptacle elongate, columnar, bearing stamens at base and pistils above, naked in between, forming a gynophore.

Fig. 4. MAGNOLIACEAE. *A. Michelia champaca*: flowering branch; *Aa*, flower; *Ab*, same, vertical section; *Ac*, androecium and gynoecium; *Ad*, stamen; *Ae*, fruit.

Stamens many; filaments short; anthers introrse. Pistils (carpels) usually numerous, spirally arranged on the receptacle, superior, subsessile, usually free, each 1-locular, with 2-many ovules; styles short; stigma simple. Fruit an aggregate of follicles dehiscing dorsally; seeds pendulous from the carpels by long threads.

Michelia champaca L., Sp. Pl. 536. 1753; King, Ann. Roy. Bot. Gard. (Calcutta) 3: 216, t. 64. 1891; Gamble, Fl. Madras 9(6). 1915.

Evergreen lofty trees. Leaves ovate-lanceolate, acute to acuminate at apex, 16-22×7-9 cm. Perianth segments 9 or more, oblong, fleshy, yellow. Staminal connective apiculate. Follicles warty, 2-3 cm long, with scarlet seeds.

Indomalaysia. Occasional in upper Shiradi Ghat. March-August. Also cultivated. Flowers very fragrant, used as an offering and worn in the hair by women. *CJS* 13258, *HFP* 2875.

4. ANNONACEAE

K. N. Gandhi

Woody climbers, shrubs or small trees, glabrous or pubescent. Leaves alternate, sometimes apparently distichous; stipules 0; blade simple, entire; venation pinnate. Inflorescence a cyme, umbel or of solitary flowers; bracts deciduous. Flowers bisexual, rarely unisexual, regular. Perianth of 3 (rarely more) trimerous whorls; outermost whorl (sepals) much smaller than the inner (petals), free or connate, mostly valvate; petals fleshy to membranous, similar or dissimilar, imbricate or valvate. Stamens many, spirally arranged on prominent torus, rarely few; connective often produced beyond anthers, generally truncate; anthers sessile or subsessile, 2-4-celled, extrorse. Pistils many, superior, free, 1-carpellate, 1-8-ovulate (connate at base and each 1-ovulate in cultivated *Annona*); stigmas clavate or capitate. Fruit an aggregate of distinct, rarely united, fruitlets (berries); endosperm ruminate.

1 Plants in fruit.
2 Fruitlets clearly or apparently sessile.
3 Climbers, with peduncles hooked ..... **Artabotrys**
3 Trees or shrubs.
4 Fruits short-stalked; petiole and branchlets glabrous; fruitlets 1-seeded ..... **Goniothalamus**
4 Fruits sessile; petiole and branchlets hirsute; fruitlets 3-4-seeded ..... **Meiogyne**
2 Fruitlets clearly stalked.
5 Stalks 1.5-2 times longer than fruitlets.
6 Climbers ..... **Uvaria**
6 Trees ..... **Polyalthia**

5 Stalks equalling or shorter than fruitlets.
7 Peduncle with bract-scar in lower half.....**Desmos**
7 Peduncle without bract-scar in lower half.....**Miliusa**
1 Plants in flower.
8 Petals dissimilar.
9 Inner 3 petals longer than outer.....**Miliusa**
9 Inner 3 petals shorter than outer.....**Goniothalamus**
8 Petals similar.
10 Petals bent in over stamens, then spreading (climbers).
11 Inner 3 petals linear.....**Artabotrys**
11 Inner 3 petals obovate to ovate.....**Uvaria**
10 Petals spreading from base (sometimes climbers).
12 Flowers sessile.....**Meiogyne**
12 Flowers pedunculate.
13 Climbers; ovules 2-6, on the suture.....**Desmos**
13 Trees; ovules 1-2, basal.....**Polyalthia**

ARTABOTRYS R. Brown

Large, glabrescent, woody shrubs climbing with hooked peduncles Flowers on leaf-opposed, woody, recurved, hooked peduncles. Sepals ovate, acuminate, cohering at base; petals often connate at base, valvate, curved over the stamens and pistils and then spreading, coriaceous, oblong, flat, acute; inner whorl slightly larger. Anthers concealed by the truncate connectives. Pistils glabrous or villous, each with 2 collateral ovules. Fruitlets sessile, clustered, 1-2-seeded.

Artabotrys zeylanicus J. Hooker & Thoms., Fl. Ind. 128. 1855; Bedd., Ic. t. 48. 1874; King, Ann. Roy. Bot. Gard. (Calcutta) 4: 43, t. 53. 1893; Gamble, Fl. Madras 14(10). 1915.

Shrubby climbers. Petiole 3-5 cm long; leaf blade elliptic or oblong-lanceolate, abruptly acuminate, rounded at base, 10-15×4-7 cm, with about 12 pairs of nerves, shining, coriaceous. Peduncle 4 cm long. Pedicel 1-3 cm long. Petals greenish turning yellow with age, to 3.5×0.7 cm, tomentose. Fruitlets ellipsoid, shortly apiculate, to 3×2 cm.

Western Ghats, Sri Lanka. Frequent in the outskirts of forests of upper Ghats. December-August. Flowers fragrant. *CJS* 13145, 16365.

DESMOS Loureiro

Erect or climbing shrubs. Flowers solitary, axillary, subterminal or subleaf-opposed; peduncle slender, with a cordate bract below the middle. Sepals ovate, acute. Petals similar, valvate, spreading, flat, chartaceous, silky. Anthers concealed by the truncate connectives. Pistils glabrous; ovules 2-8 in each locule. Fruitlets short-stalked, clustered, elongated or moniliform, 2-few-seeded.

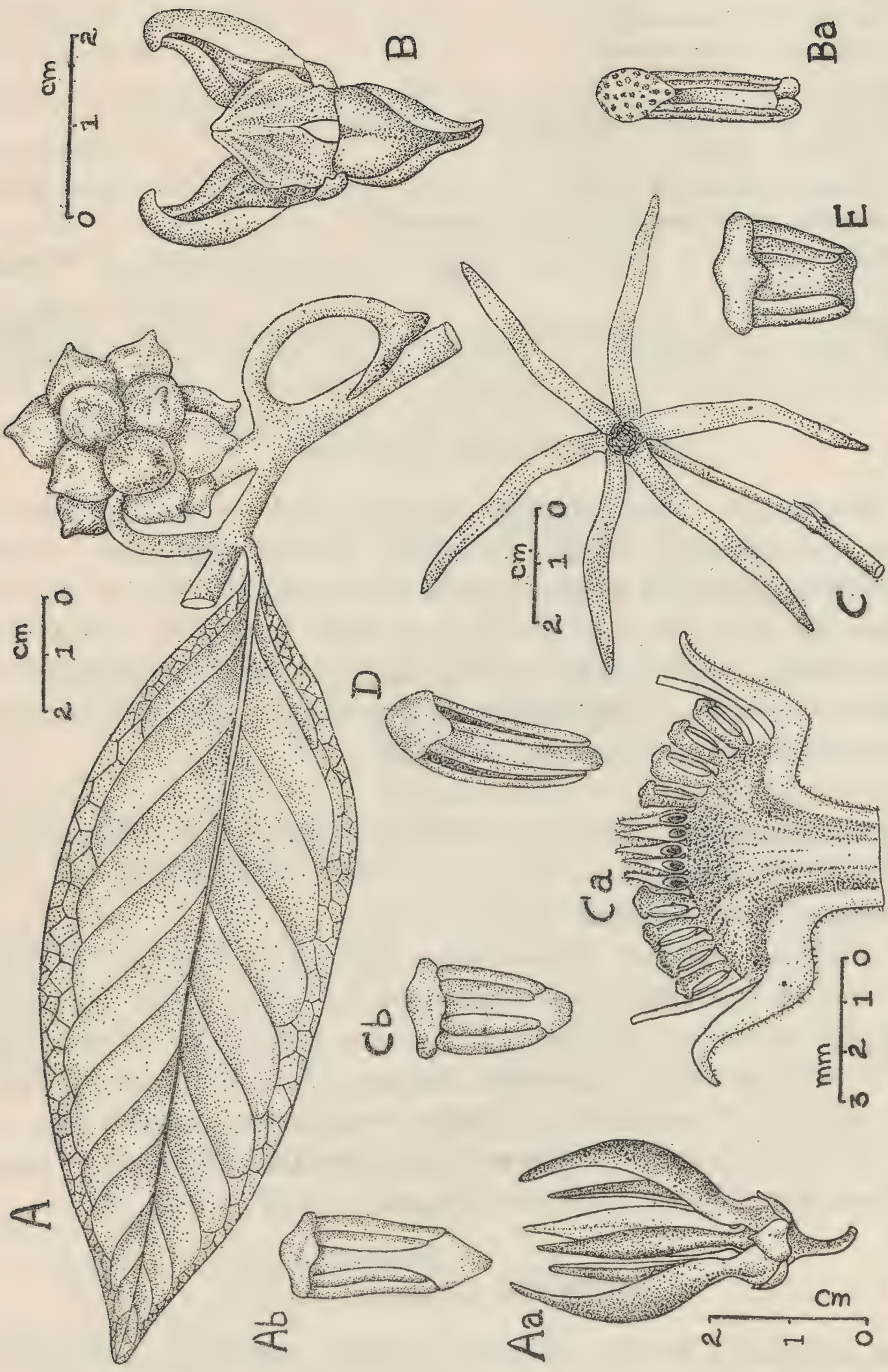


Fig. 5. ANNONACEAE. *A. Artabotrys zeylanicus*: fruiting branch; *Aa*, flower; *Ab*, stamen. *B. Goniothalamus cardiopetalus*: flower; *Ba*, stamen. *C. Polyalthia fragrans*: flower; *Ca*, vertical section of flower bud; *Cb*, stamen. *D. Uvaria narum*: stamen. *E. Desmos lawii*: stamen.

Desmos lawii (J. Hooker & Thoms.) Safford, Bull. Torrey Bot. Club 39: 506. 1912. *Unona lawii* J. Hooker & Thoms., Fl. Ind. 132. 1855; Bedd., Ic. t. 73. 1874; King, Ann. Roy. Bot. Gard. (Calcutta) 4: 57, t. 77A. 1893; Gamble, Fl. Madras 15(10). 1915.

Climbing shrubs; young branches silky-pubescent. Petiole 3-5 mm long; leaf blade ovate-oblong, lanceolate, acuminate, rounded at base, to 12×4 cm, with as many as 12 pairs of nerves, glabrous above, pubescent and glaucous beneath, subcoriaceous. Peduncle 4-5 cm long, pubescent, bearing bracts at the middle. Sepals 0.8 cm long; petals green, turning yellow with age, 6-8×0.4 cm.

South India. Occasional shrubs, climbing on other trees in lower Ghats. Collected only in flower (April). *CJS* 16815, 16941.

GONIOTHALAMUS J. Hooker & Thomson

Large shrubs or small trees. Flowers solitary or fascicled, axillary, or extra-axillary, on a slightly woody peduncle, with basal bracts. Sepals ovate or suborbicular, pubescent; outer petals valvate, fleshy, glabrous or tomentose, hooded or flat; inner petals smaller, clawed, cohering as a cap over stamens and pistils. Anthers concealed by the overlapping connectives. Pistils hairy; ovules 1-4, basal; stigma simple or 2-fid. Fruitlets subsessile, clustered, 1-4-seeded.

Goniothalamus cardiopetalus (Dalzell) J. Hooker & Thoms., Fl. Ind. 107. 1855; Bedd., Ic. t. 62. 1874; King, Ann. Roy. Bot. Gard. (Calcutta) 4: 93, t. 129. 1893; Gamble, Fl. Madras 18(13). 1915. *Polyalthia cardiopetala* Dalzell, Hooker's J. Bot. Kew Gard. Misc. 2: 39. 1850.

Small trees to 3.5 m. Petiole 0.5 cm long; leaf blade obovate or oblong, abruptly acute at apex, cuneate at base, to 18×6 cm, with about 10 pairs of nerves forming intramarginal loops, glabrous, subcoriaceous. Flowers solitary; peduncle 0.7 cm long. Petals greenish without, pinkish inside, tomentose; outer petals 1.5 cm long, hooded. Stigma 2-fid. Fruitlets 1 cm long, pubescent, green, turning red with age, 1-seeded.

Western Ghats. Occasional shrubs in forest undergrowth of Ghats. January-September. *CJS* 14473, *HFP* 59.

MEIOGYNE Miquel

Large shrubs; young branchlets and petioles hirsute. Flowers solitary, subsessile, axillary, leaf-opposed or terminal. Sepals ovate, acute, tomentose outside; petals similar, valvate, oblong-lanceolate, acute, flat, spreading from the base, villous. Anthers concealed by the

truncate connectives. Pistils strigose; ovules few-many in each locule, uniseriate on the ventral suture; stigma capitate. Fruitlets subsessile, clustered, slightly moniliform, few-many-seeded.

Meiogyne ramarowii (Dunn) Gandhi, *comb. nov. Unona ramarowii* Dunn, Bull. Misc. Inform. 183. 1914; Gamble, Fl. Madras 15(10). 1915.

Large shrubs or small trees. Petiole 0.5-1 cm long; leaf blade elliptic-oblong or ovate, acuminate at apex, rounded-acute at base, pellucid-punctate, subcoriaceous, to 15×7 cm with 8 pairs of nerves prominent beneath. Inner petals pale yellow, 2-3 cm long. Fruitlets 2 cm long, apiculate, sparsely hairy, few-seeded.

South India. Occasional in forest undergrowth in Ghats. February-August. *CJS* 13157, *HFP* 449.

Note: This species has hard, glabrescent, slightly torulose fruitlets. It is closely related to *Meiogyne pannosa* (Dalzell) Sinclair which is reported (by Gamble) as having soft, velvety, globose fruitlets.

MILIUSA Leschenault

Shrubs or trees. Flowers bisexual, rarely unisexual, solitary or fascicled, axillary or leaf-opposed, peduncled. Sepals small; outer petals equalling sepals; inner petals larger, cohering when young, becoming free, usually flat. Anther cells not concealed. Ovules 1-2, rarely to 4 in each locule. Fruitlets few-many, stalked, usually 1-2-seeded.

1 Leaves tomentose.....*M. velutina*
1 Leaves at most pubescent.....*M. wightiana*

Miliusa velutina (Dunal) J. Hooker & Thoms., Fl. Ind. 151. 1855; Bedd., Fl. Sylv. t. 37. 1870; Ic. t. 87. 1874; King, Ann. Roy. Bot. Gard. (Calcutta) 4: 158, t. 206. 1893; Gamble, Fl. Madras 21(15). 1915. *Uvaria velutina* Dunal, Anon. 91. 1817.

Deciduous trees to 10 m; young parts tomentose. Petiole 3-5 mm long; leaf blade ovate, acute or obtuse at apex, rounded or slightly cordate at base, to 8×5 cm, with 8 pairs of nerves forming intramarginal loops, shining. Peduncle 4-6 cm long. Inner petals tomentose outside, glabrous inside, yellow. Fruitlets subglobose, purple, 2 cm across, on woody stalks (1.5-2 cm long).

India, Burma. Rare; collected once at Nagpuri (hills on plateau) in fruit on July 16, 1969. *CJS* 14112.

Miliusa wightiana J. Hooker & Thoms., Fl. Ind. 149. 1855; Bedd., Ic. t. 86. 1874; King, Ann. Roy. Bot. Gard. (Calcutta) 4: 156, t. 202B. 1893; Gamble, Fl. Madras 21(15). 1915.

Evergreen, glabrescent, large shrubs. Petiole 0.6 cm long; leaf blade oblong-lanceolate, acuminate, rounded at base, to 14×4 cm, with about 8 pairs of nerves, glabrous, shining above, chartaceous. Peduncle 4-5 cm long. First 2 whorls of perianth (sepals and outer petals) ciliate at margin; inner petals oblong, acute, greenish, glabrous. Fruitlets globose, apiculate, 1.5 cm long (including the stalk).

South India. Occasional; collected once from Kempuhole (lower Shiradi Ghat) on December 17, 1969 in fruit only. *CJS* 15873.

POLYALTHIA Blume

Medium trees or shrubs. Inflorescence a cyme, umbel or of solitary flowers, axillary, terminal or leaf-opposed. Pedicels with a distinct bract at or below the middle. Sepals ovate, acute; petals in 2-3 whorls, similar, valvate, oblong, flat, spreading from the base. Anthers concealed by the overlapping connectives. Pistils each with 1-2 basal ovules. Fruitlets sessile or stalked, 1-seeded.

Polyalthia fragrans (Dalzell) Bedd., Fl. Sylv. t. 74. 1871; Ic. t. 54. 1874; King, Ann. Roy. Bot. Gard. (Calcutta) 4: 72, t. 100A. 1893; Gamble, Fl. Madras 16 (11). 1915. *Guatteria fragrans* Dalzell, Hooker's J. Bot. Kew Gard. Misc. 3: 206. 1851.

Trees to 16 m. Petiole 1 cm long; leaf blade oblong-lanceolate, abruptly acute, rounded at base, to 30×10 cm, with 18 pairs of nerves, glabrous, chartaceous. Cyme often on old wood, few-flowered, tomentose. Pedicels 3-5 cm long. Petals pale yellow, 4-6 cm long. Fruitlets ovoid, 2 cm long, shortly apiculate, on 3-4 cm long stalks, ash-colored.

Western Ghats. Occasional trees along road cuttings or in forest undergrowth in lower Ghats. October-March. *CJS* 13057, *HFP* 2544.

Note: Polyalthia longifolia (Sonnerat) Thwaites, the fake Ashoka Tree, is commonly cultivated in gardens and avenues. The columnar cultivar is striking.

UVARIA Linnaeus

Shrubby climber; young branches with sparse, scattered stellate hairs. Inflorescence a cyme, umbel or flowers solitary or fascicled, axillary, terminal or leaf-opposed, stellate-pubescent. Peduncle short and slender in flower, elongating and woody in fruit. Sepals connate at base, suborbicular; petals sometimes connate at base, imbricate, obovate-ovate, acute, similar. Anthers concealed by the overlapping connective. Ovules 6-10, in 2 series in each locule. Fruitlets many, long-stalked, sausage-shaped, few-many-seeded, constricted.

Uvaria narum (Dunal) Wight & Arn., Prodr. 9. 1834; King, Ann.

Roy. Bot. Gard. (Calcutta) 4: 27, t. 21. 1893; Gamble, Fl. Madras 13(9). 1915. *Unona narum* Dunal, Anon. 99. 1817. *Unona hookeri* King, *l. c.* 28, t. 22.

Leaf blade oblong-lanceolate or ovate, abruptly acuminate, rounded at base, to 14×4 cm, with 12 pairs of nerves forming indistinct, intramarginal loops, glabrous, subcoriaceous. Flowers solitary; peduncle 2 cm long, accrescent. Petals brown, 1 cm across. Fruitlets 4 cm long, cylindrical, on woody stalks to 8 cm long.

South W. India, Sri Lanka. Occasional woody climber near Yethinahalla and Hettur in thickets (upper Ghats). January-September. *CJS* 11130, 14566.

* * *

Three species of *Annona* are cultivated for their fruit: The Soursop *(Annona muricata* L.*)* with prickly fruits, the Custard-apple *(A. squamosa* L.*)* with a glaucous, lumpy fruit, the Bull's Heart *(A. reticulata* L.*)* with a smooth exterior.

5. MYRISTICACEAE

K. N. Gandhi

Evergreen, usually dioecious trees. Leaves alternate; stipules 0; blade simple, entire, pellucid-punctate or not; venation pinnate. Inflorescence of axillary or lateral panicles, racemes, cymes, umbels or fascicles. Flowers 3-merous, unisexual; bracteoles present or absent, caducous. Perianth of 3 valvate lobes, free or connate. Staminate flower: stamens 3 or more; filaments and/or connective connate into a column; anthers extrorse; pistillode absent. Pistillate flower without staminodes; ovary superior, 1-locular, with solitary, basal ovule; style short or 0; stigmas 2, free or connate, entire or lobed. Fruit fleshy or dry, ultimately splitting by 2 valves, rarely indehiscent; seeds erect, with aril laciniate from base or only at tip; endosperm ruminate.

1 Staminate flower with anthers stellately spreading from peltate disc of column; fruit longer than broad; aril laciniate only at top ..... **Knema**
1 Staminate flower with anthers around column below its apex; fruits about as broad as long; aril laciniate to the base ..... **Myristica**

KNEMA Loureiro

Trees. Leaves chartaceous or coriaceous, glaucous beneath, with prominent secondary veins. Inflorescence of racemes or umbellate fascicles in axils of existing or fallen leaves; peduncle thick, persistent, producing flowers for more than one season. Bracteole at the base of

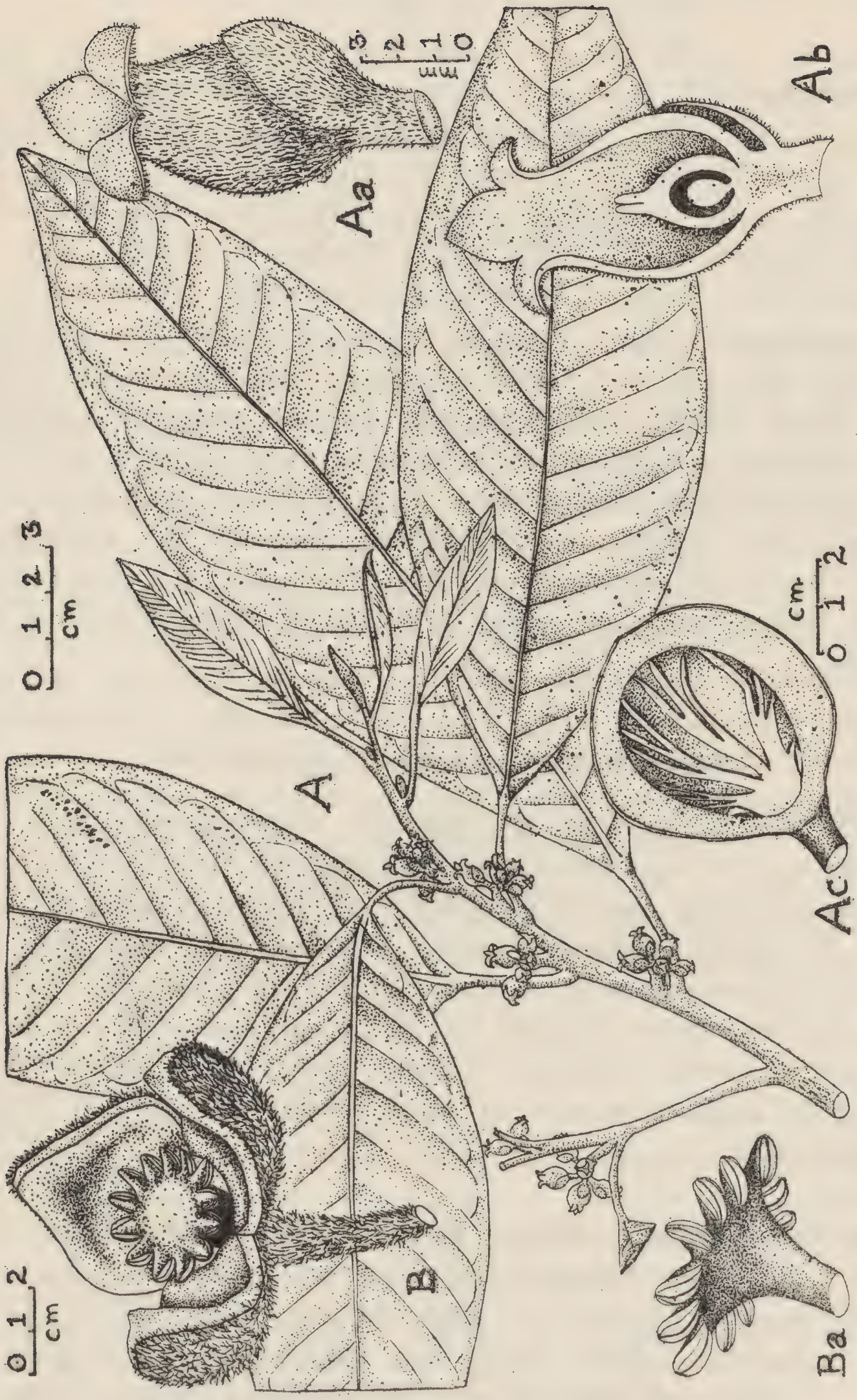


Fig. 6. MYRISTICACEAE. *A.* *Myristica dactyloides*: flowering branch; *Aa*, female flower; *Ab*, same, vertical section; *Ac*, section of fruit. *B.* *Knema attenuata*: male flower; *Ba*, staminal column with anthers.

perianth or on the pedicel. Perianth 3-lobed, hairy outside. Stamens 8 or more; filaments and connectives connate, forming a peltate disc; anthers stellately spreading from the disc, sessile or stalked. Ovary ovoid, hairy; stigmas subsessile, connate into a disc and laciniate or free. Fruits fleshy; aril laciniate only at top.

Knema attenuata (J. Hooker & Thoms.) Warb., Monogr. Myrist. 590. 1897; Gamble, Fl. Madras 1215(851). 1925. *Myristica attenuata* Wall. ex J. Hooker & Thoms., Fl. Ind. 157. 1855; King, Ann. Roy. Bot. Gard. (Calcutta) 3: 316, t. 152. 1891. *Myristica corticosa* Bedd., Fl. Sylv. t. 271. 1872; non J. Hooker & Thoms., 1855.

Trees to 10 m. Petiole 1.5 cm long; leaf blade oblong-lanceolate, abruptly acuminate at apex, rounded at base, to 22×7 cm, with about 18 pairs of veins, and with regular, distinct secondary veins, stellate-pubescent when young, subcoriaceous. Umbels stellately tomentose; peduncle with the scars of previous pedicels, 3-5 mm long; pedicels 2-4 mm long, with bracteole about the middle. Perianth brown tomentose outside, glabrous and pink inside. Anthers sessile. Stigmas free, each shortly 2-4-lobed. Fruits brown-tomentose, oval, 4×2 cm; aril crimson.

South W. India. Frequent across the Ghats. December-May. *CJS* 12845, 15891.

MYRISTICA Gronovius *nom. cons.*

Trees. Leaves chartaceous or coriaceous or pergamentaceous, often glaucous, with or without scales beneath; veins mostly impressed above. Inflorescence of cymes, umbels or of fascicled flowers in leaf axils, sometimes on old wood; peduncle thick, persistent or not. Bracteoles persistent, at the base of perianth. Perianth 3-lobed. Stamens 8 or more; filaments and connectives connate into a column and produced beyond the elongate, suberect anthers. Ovary ovoid, glabrous or hairy; stigmas sessile, connate except at apex. Fruits fleshy; aril of seeds laciniate from base.

Myristica dactyloides Gaertner, Fruct. 1: 195, t. 41, f. 2a-d. 1788; Sinclair, Gard. Bull. Straits Settlem. 23: 445. 1968. *Myristica contorta* Warb., Monogr. Myrist. 507. 1897; Gamble, Fl. Madras 1214 (850). 1925. *Myristica beddomei* King, Ann. Roy. Bot. Gard. (Calcutta) 3: 291, t. 118, f. 1-8. 1891; Gamble, Fl. Madras 1214(850). 1925.

Lofty trees to 30 m. Petiole 2-4 cm long; leaf blade elliptic to oblong-lanceolate, bluntly acute at apex, subacute or rounded at base, to 30×11 cm, glabrous, shining above, glaucous and without scales beneath; primary veins as many as 18 pairs, slightly raised beneath; secondary veins

indistinct. Umbels rusty-tomentose; peduncle persistent and accrescent, simple or branched, producing flowers for more than one season, bearing scars of previous pedicels. Flowers subsessile. Perianth tomentose. Fruits 1-3 together, ovoid, powdery-brown, to 6×4 cm; aril creamy-white.

South India, Sri Lanka. Frequent in upper Ghats. October-May. *CJS* 11416, 16669.

Note: The fruits of previous season often persistent.

6. LAURACEAE

K. N. Gandhi

Aromatic and/or gland-dotted shrubs or trees; rarely herbaceous, twining, leafless parasites. Leaves alternate, sometimes subopposite or clustered at tips of branchlets; stipules 0; blade simple, entire; venation pinnate or triplinerved. Inflorescence basically cymose, but ranging from panicles to pseudo-umbels or solitary flowers; bracts often involucrate, generally deciduous. Flowers bisexual, unisexual or polygamous, regular, usually 3-merous. Perianth tube short, persistent and often accrescent in fruit; lobes subequal, in 2 poorly differentiated series, imbricate, accrescent or partly or fully deciduous. Stamens basically in 4 whorls of 3 each; the third whorl with 2 glands at the base of each filament; the fourth whorl usually of stipitate, cordate staminodes, rarely perfect or absent; anthers 2- or 4-celled, characterized by valvular dehiscence, all introrse, or third whorl extrorse, sometimes lower cells dehiscing laterally. Staminodes present in pistillate flowers. Ovary usually superior, sessile, 1-locular with solitary, pendulous ovule; style short; stigma simple or 3-fid. Fruit usually baccate, resting on or enclosed by perianth remnants.

1 Twining, parasitic herbs..... **Cassytha**
1 Trees and shrubs.
2 Leaves triplinerved.
3 Leaves usually opposite. Inflorescence a paniculate cyme. Perianth lobes 6..... **Cinnamomum**
3 Leaves mostly alternate. Inflorescence of sessile umbels. Perianth lobes 4..... **Neolitsea**
2 Leaves penninerved.
4 Inflorescence of umbels (solitary, clustered or in panicles); bracts deciduous after anthesis..... **Litsea**
4 Inflorescence not of umbels; bracts deciduous before flowering.
5 Anthers introrse or lower cells lateral; inflorescence a short raceme..... **Actinodaphne**
5 Anthers of third whorl extrorse; inflorescence a paniculate cyme.
6 Leaves minutely pubescent beneath; fruiting perianth erect..... **Phoebe**
6 Leaves glabrous.

Fig. 7. LAURACEAE. *A.* *Cinnamomum sulphuratum*: flowering branch. *B. Persea macrantha*: vertical section of flower; *Ba*, fruit. *C. Neolitsea scrobiculata*: vertical section of flower. *D. Phoebe cathia*: flower. *E. Litsea laevigata*: flower. *F. Cinnamomum macrocarpum*: fruit.

7 Perianth glabrescent, 3-4 mm long (in flower), erect or deciduous in fruit..... .....**Alseodaphne**
7 Perianth silky-pubescent, 5-6 mm long (in flower), reflexed in fruit..... .....**Persea**

ACTINODAPHNE Nees

Evergreen, dioecious trees. Leaves subverticillate, often scattered, subopposite; venation usually pinnate. Inflorescence a short raceme or of flowers clustered on a short, slender peduncle, axillary; bracts caducous before flowering. Flowers unisexual, with elongating pedicels. Perianth 6-lobed, enlarging in fruit. Stamens 9, in 3 whorls; anthers 4-celled, introrse or lower pair of cells lateral. Pistillode present or absent. Pistillate flower with 9 staminodes. Ovary ovoid; style erect; stigma dilated. Berry seated on the flat or concave perianth tube.

Actinodaphne malabarica Balakrishnan, J. Bombay Nat. Hist. Soc. 63: 329. 1967. *Actinodaphne hirsuta* J. Hooker, Fl. Brit. India 5: 152. 1886, non Blume. 1851; Gamble, Fl. Madras 1231(862). 1925.

Lofty trees to 20 m. Petiole 1.5-2.5 cm long; leaf blade obovate, lanceolate, acuminate, cuneate, to 23×5 cm, with 9-12 pairs of nerves, glabrous, shining above. Peduncle 3 cm long, hirsute. Perianth yellow.

Western Ghats. Occasional in upper Ghats. September-December. *HFP* 812, 2215.

Note: Several collections have been placed here with doubt. The leaves are not 'fulvous-villous beneath' as characterized by Gamble. Also, the inflorescence is a raceme, not an umbel. This may be a new species allied to *Actinodaphne leiantha* (Kurz) J. Hooker of the Andaman Islands, one of the few species of the genus with a racemose inflorescence.

ALSEODAPHNE Nees

Evergreen trees. Leaves alternate, often crowded at the ends of the branchlets, penninerved. Inflorescence a terminal panicle, branches ending in subumbels; bracts caducous. Flowers bisexual, pedicelled. Perianth lobes 6, scarcely enlarged in fruit. Stamens 9, in 3 whorls; first 2 whorls introrse; 3rd whorl extrorse; anthers 4-celled. Staminodes cordate, forming the 4th whorl. Ovary globular; style erect; stigma peltate. Berry globose, seated on the truncate, swollen peduncle.

Alseodaphne semecarpifolia Nees in Wall., Pl. As. Rar. 2: 72. 1831.

var. **angustifolia** Meisner in DC., Prodr. 15(1): 28. 1864; Gamble, Fl. Madras 1226(858). 1925.

Trees to 8 m. Petiole 1 cm long; leaf blade elliptic-oblong, slightly obovate, acute at apex, rounded or attenuate at base, to 10×4 cm, with

6-8 pairs of nerves, shining above, glaucous beneath. Panicles crowded at apex; peduncle 8-12 cm long; branches spreading. Perianth funnel-shaped, small, green, pubescent, erect or deciduous in fruit.

Western Ghats, Sri Lanka. Occasional; collected once in flower from lower Bisle Ghat on March 11, 1970. *CJS* 16520.

CASSYTHA Linnaeus

Herbaceous, twining parasites; stem attached to host by suckers. Leaves reduced to scales or 0. Inflorescence spicate or capitate; bracts deciduous. Flowers bisexual, small; bracteoles 3, persistent, subtending the calyx. Perianth lobes 6. Stamens 9, in 3 whorls; outer 2 whorls introrse; 3rd whorl extrorse; anthers 2-celled. Staminodes of 4th whorl stipitate. Ovary globular; style erect; stigma small. Drupe enclosed in enlarged perianth.

Cassytha filiformis L., Sp. Pl. 35. 1753; Wight, Ic. t. 1847. 1852; Gamble, Fl. Madras 1241(868). 1925.

Pubescent twiners; stem filiform, twining to the right, green, branched. Spike 2-4 cm long. Flowers lax, white. Drupe globose, smooth.

Tropics. On small trees and shrubs in dry deciduous scrub. July-October. *CJS* 17903, *HFP* 506.

CINNAMOMUM Schaeffer

Evergreen shrubs or small trees with aromatic bark and leaves. Leaves usually opposite, rarely alternate, triplinerved, with horizontal nervules. Inflorescence a paniculate cyme, axillary and terminal; bracts caducous. Flowers bisexual, pedicelled. Perianth funnel-shaped, tube short; lobes 6, persistent or partly or fully deciduous in fruit. Stamens 9 in 3 whorls; outer 2 whorls introrse, inner whorl extrorse; 4th whorl of cordate staminodes; anthers 4-celled. Ovary enclosed in perianth tube; stigma discoid or obscurely 3-toothed.

1 Leaves large (16-24 cm long); young growth grey pubescent becoming glabrescent.... ..... *C. macrocarpum*

1 Leaves smaller (less than 7 cm long); young growth fulvous-tomentose, becoming glabrescent..... *C. sulphuratum*

Cinnamomum macrocarpum J. Hooker, Fl. Brit. India 5: 133. 1886; Gamble, Fl. Madras 1225(857). 1925. *Cinnamomum iners* auct. non Blume. 1826: Wight, Ic. t. 122, 130. 1839; Gamble, Fl. Madras 1224(857). 1925.

Petiole 2 cm long; leaf blade elliptic-oblong, obtuse to acuminate

at apex, rounded to attenuate at base, to 25×8 cm; central 3 veins distinct and reaching the leaf apex, outermost 2 ending below the middle or absent. Panicle grey pubescent, shorter than leaves. Flowers small; pedicels 0.5-1 cm. Berry oblong, to 2 cm long.

Western Ghats. Occasional in upper Ghats. January-June. *CJS* 16256, *HFP* 1668.

Note: *Cinnamomum iners* Blume is a Malesian species. Gamble's specimens of *C. iners* at Kew have been annotated by A. Kostermans as *C. macrocarpum*. However, Kostermans feels (personal communication) that our material represents a new species.

The bark and leaves of this species are used as a spice for flavoring food.

Cinnamomum sulphuratum Nees in Wall., Pl. As. Rar. 2: 74. 1831; Gamble, Fl. Madras 1225(857). 1925.

Trees to 8 m; young parts including undersurface of leaves and inflorescence fulvous-tomentose. Petiole 1 cm long; leaf blade ovate-lanceolate, acute or obtuse at apex, rounded at base, to 7×3 cm; veins reaching 3/4th the length of the leaf. Panicle yellow tomentose. Flowers 0.6 cm long (including pedicel), yellow. Berry ellipsoid, 1 cm long.

Western Ghats. Scattered in upper Ghats. January-April. *HFP* 1314, 1558.

Note: This species seems to include the former if one uses a broad species concept. Only a few specimens are at the extremes, most fall in between. Collections clearly keying to *C. sulphuratum* are: *HFP* 1314 and 1558. Other collections have larger leaves (10-14 cm) but are fulvous tomentose, at least in the panicles. These are: *CJS* 12499, 12905, 15940, 16408, 16582. We wonder if these taxa are, indeed, distinct species.

The specimens at Kew which were treated by Gamble as *C. perottetii* have been annotated by A. Kostermans as *C. sulphuratum*.

LITSEA Lamarck *nom. cons.*

Evergreen, dioecious trees. Leaves alternate, sometimes opposite, penninerved. Inflorescence umbellate, axillary; umbels solitary, clustered or in panicles; bracts 4-6, distinct, involucrate, deciduous after flowering. Flowers 5-many in each umbellule, pedicelled. Perianth funnel-shaped; tube short; lobes 6, often incomplete in staminate flowers. Stamens 9 or 12 in 3-4 whorls, inner whorls glandular; anthers 4-celled, all introrse. Rudimentary ovary present or absent in staminate flower. Staminodes in pistillate flower 9-12, outer 2 whorls linear, eglandular, inner whorls subulate, glandular. Ovary free or enclosed in perianth tube; style thick; stigma dilated. Fruit on cupular, enlarged perianth; perianth lobes deciduous.

1 Umbellules solitary.....*L. deccanensis*
1 Umbellules not solitary.
2 Peduncle less than 0.5 cm long. Leaves glabrous.....*L. laevigata*
2 Peduncle 3.6 cm long. Leaves tomentose beneath.....*L. floribunda*

Litsea deccanensis Gamble, Fl. Madras 1235(864). 1925. *Litsea tomentosa* Heyne ex J. Hooker, Fl. Brit. India 5: 157. 1886, non Blume. 1826.

Shrubs or small trees; young branchlets, leaves, inflorescence softly tomentose. Leaves often crowded at the ends of branchlets; petiole 1-2 cm long; blade obovate, abruptly acuminate, cuneate at base, to 20×10 cm, subcoriaceous; nerves 10-14 pairs, distinct. Peduncle 0.5-1 cm long. Perianth brown; lobes 0 or incomplete. Berry globular, 1 cm across.

South India, Sri Lanka. Fairly common in upper Ghats especially in the undergrowth of forests. August-March. *CJS* 15516, *HFP* 1233.

Litsea floribunda (Blume) Gamble, Fl. Madras 1238(867). 1925. *Cylicodaphne floribunda* Blume, Mus. Bot. 1: 387. 1857. *Tetranthera wightiana* sensu Bedd., Fl. Sylv. t. 293. 1873, not as to basionym. *Litsea wightiana* sensu J. Hooker, Fl. Brit. India 5: 177. 1886, not as to basionym.

Trees to 8 m; young parts tomentose. Petiole 1 cm long; leaf blade elliptic-oblong to obovate, acute or abruptly acuminate at apex, subacute at base, 16×8 cm, glabrous above, brown tomentose beneath, coriaceous; nerves 9-12 pairs, prominent beneath. Umbellules in panicles; peduncle 3-6 cm long. Perianth white; lobes complete. Berry ovoid, 1-1.5 cm long.

Western Ghats. Fairly common in upper Ghats, easily spotted by the yellow bracts of immature flowers. All seasons. *HFP* 96, 1232.

Litsea laevigata (Nees) Gamble, Fl. Madras 1236(865). 1925. *Tetranthera attenuata* var. *laevigata* Nees, Syst. Laur. 667. 1836.

Trees to 10 m. Petiole 0.5-1 cm long; leaf blade elliptic-oblong, acute or acuminate at apex and base, up to 14×4 cm, glabrous beneath, coriaceous; nerves prominent below. Umbellules fascicled or shortly panicled; peduncles less than 0.5 cm long, pubescent. Perianth white; lobes complete. Berry ellipsoid, 1-1.2 cm long.

Western Ghats. Frequent across Ghats. September-April. *CJS* 15516, 16684.

NEOLITSEA Merrill

Evergreen, dioecious small trees. Leaves opposite, alternate or whorled, triplinerved from above base; lateral veins terminating near midleaf. Inflorescence umbellate, in upper axils or lateral in between 2 nodes; bracts 4, involucrate deciduous; umbellules clustered or in a panicle, with a short peduncle, 4 to many-flowered. Flowers unisexual; pedicels accrescent. Perianth lobes 4, deciduous. Stamens 6 in 3 whorls;

anthers 4-celled, all introrse or lower cells lateral. Pistillode present or absent in staminate flower. Staminodes in pistillate flower 6, linear, clavate. Ovary ovoid; style thick; stigma capitate. Berry seated on slightly enlarged perianth tube.

Neolitsea scrobiculata (Meisner) Gamble, Fl. Madras 1240(868). 1925.
Litsea scrobiculata Meisner in DC., Prodr. 15(1): 223. 1864.

Trees. Petiole 3-6 cm long; leaf blade elliptic-ovate, acuminate at apex, acute at base, to 11×5 cm, minutely pitted, coriaceous; nerves from midrib 2-3 pairs, faint. Umbels subsessile. Perianth lobes glabrous, greenish. Fruiting perianth cupular, entire, 0.6 cm long. Berry 0.8 cm across.

Western India. Occasional in upper Bisle Ghat. November-February. *CJS* 11383, 15895.

PERSEA Miller

Evergreen trees. Leaves alternate, appearing clustered at ends of branchlets, penninerved. Inflorescence a panicle, subterminal; bracts caducous. Flowers bisexual, pedicelled. Perianth tube short; lobes 6. Stamens 9, outer 2 whorls introrse, inner whorl extrorse; anthers 4-celled. Staminodes of the 4th whorl stipitate, cordate. Ovary ovoid; style narrow; stigma discoid. Fruit a berry, seated on slightly enlarged perianth; fruiting perianth lobes reflexed.

Persea macrantha (Nees) Kostermans, Reinwardtia 6: 193. 1962; Sant., Fl. Khandala ed. 3, 231. 1967. *Machilus macrantha* Nees in Wall., Pl. As. Rar. 2: 70. 1831; Wight, Ic. t. 1824. 1852; Bedd., Fl. Sylv. t. 264. 1872; Gamble, Fl. Madras 1227 (859). 1925. *Machilus glaucescens* Wight, Ic. t. 1825. 1852.

Trees to 10 m. Petiole 3-4 cm; leaf blade elliptic-oblong, obtuse or acute at apex, rounded at base, to 16×8 cm, pale green, glabrous, subcoriaceous; nerves 7-10 pairs, faint. Peduncle to 18 cm, sparsely pubescent. Perianth greenish-yellow, pubescent. Berry globular, smooth, 2 cm across.

South India, Sri Lanka. Occasional in Ghats. January-April. *CJS* 13306, 16191. Locally known as 'Kurma' and used for its timber.

Note: According to Kostermans (personal communication) our material is not the true *Persea macrantha* but represents a new species.

PHOEBE Nees

Evergreen trees; leaves alternate, clustered at apex, penninerved.

Inflorescence paniculate in upper axils; bracts deciduous. Flowers bisexual or rarely polygamous, pedicelled. Perianth tube short; lobes 6, erect, slightly accrescent in fruit. Stamens 9, outer 2 whorls introrse, inner whorl extrorse, 4th whorl of staminodes. Ovary globular; style linear; stigma discoid. Fruiting perianth lobes erect, clasping the base of the fruit.

Phoebe cathia (D. Don) Gandhi, *comb. nov.* *Cinnamomum cathia* D. Don, Prodr. Fl. Nepal. 66. 1825. *Ocotea paniculata* Nees in Wall., Pl. As. Rar. 2: 71. 1831. *Phoebe paniculata* (Nees) Nees var. *glabrescens* Nees, Syst. Laur. 105. 1836; Gamble, Fl. Madras 1228(860). 1925.

Trees to 10 m; branchlets, leaves and inflorescence with appressed pubescence. Petiole 1-2 cm long; leaf blade elliptic-oblong to obovate, abruptly acuminate at apex, acute at base, to 15 × 8 cm, becoming glabrescent with age, creamy-white beneath, subcoriaceous; nerves 6 pairs, faint above. Peduncle slender, 6-12 cm long. Perianth greenish-yellow. Berry globular or ellipsoid, 1-1.5 cm long, smooth.

Western Ghats, Central Himalayas to Burma. Occasional in upper Ghats. November-June. *CJS* 16213, 16740.

7. PIPERACEAE

T. P. Ramamoorthy

Herbs, shrubs, climbers or trees, sometimes epiphytic. Leaves alternate, opposite or whorled; stipules present or absent, sometimes modified into auricles or basal dilations; blade entire, membranous to coriaceous, often pellucid-dotted, usually palmately veined. Inflorescence terminal, axillary or leaf-opposed, usually dense spikes. Flowers bracteate, minute, unisexual and dioecious or bisexual. Perianth 0. Stamens hypogynous, 1-10, usually free; anther with 2 separate or confluent, longitudinally dehiscing cells. Ovary superior, 1-locular; ovule 1, basal, orthotropous; styles 1-5, sometimes absent. Stigmas 3-5, usually capitate. Fruit a 1-seeded berry.

1 Leaves opposite or whorled. Succulent herbs, usually epiphytic.....**Peperomia**
1 Leaves alternate. Woody, erect, undershrubs or rooted climbers.
2 Erect undershrubs; leaves cordate; inflorescence axillary.....**Lepianthes**
2 Rooted climbers; leaves not cordate, inflorescence leaf-opposed.....**Piper**

LEPIANTHES Rafinesque

Note: *Lepianthes* Rafinesque (1838) has priority over *Pothomorphe* Miquel (1839) and *Heckeria* Kunth (1839).

Fig. 8. PIPERACEAE. *A. Lepianthes umbellata*: flowering branch; *Aa*, bisexual flower with peltate bract; *Ab*, fruit.

Usually a branching shrublet. Leaves alternate; petiole long, clasping the stem; blade large, peltate-cordate, acute, palmately veined, minutely gland-dotted. Inflorescence axillary, of several subumbellate spikes on a stout axillary peduncle. Flowers bisexual, sessile. Stamens 2-3. Styles 3. Fruit a cuneiform, trigonous berry.

Lepianthes umbellata (L.) Raf., Sylva Tellur. 84. 1838. *Piper umbellatum* L., Sp. Pl. 30. 1753. *Piper subpeltatum* Willd., Sp. Pl. 1: 166. 1797. *Heckeria subpeltata* (Willd.) Kunth, Linnaea 13: 171. 1839; Gamble, Fl. Madras 1208(846). 1925. *Pothomorphe subpeltata* (Willd.) Miq., Syst. Pip. 213. 1843; Wight, Ic. t. 1925. 1853; Backer & Bakh. f., Fl. Java 1: 168. 1963.

Leaves to 25×25 cm, suborbicular, cordate, shortly pubescent on nerves on both surfaces. Petiole about 20 cm long. Stalk of inflorescence from 3-6 cm.

Paleotropics. Common in Ghats. Usually in shade along streamlets. April-December. *CJS* 16784, *HFP* 1152.

Note: The type of *Piper umbellatum* L. is from the Neotropics while that of *P. subpeltatum* Willd. is from the Paleotropics. The descriptions comparing these taxa (C. DC. in DC., *Prod.* 16(1): 383. 1869) are virtually identical. In addition C. deCandolle proposed a Brazilian variety (var. *sidifolia*) in the Old World species (*P. subpeltatum*). African floras (Baker & Wright in Thistleton & Dyer, *Flora of Tropical West Africa* 6(1): 144. 1913; Hutchinson, *Flora of Tropical West Africa* 1 : 84. 1954) have synonymized these species. We accept this view.

PEPEROMIA Ruiz & Pavon

Annuals or perennials. Leaves opposite, ternate or whorled, estipulate, usually pellucid-punctate, sometimes hairy. Inflorescence terminal, unisexual. Flowers sessile, sunk in rachis, subtended by a peltate orbicular bract. Stamens 2; filaments short. Ovary acute or beaked with an eccentric or terminal penicillate stigma. Fruit minute.

1 Leaves subsessile, generally whorled; spike hairy.....*P. reflexa*
1 Leaves petioled, opposite, sometimes whorled; spike glabrous.
2 Plant robust, leaves more than 1.5 cm long; internodes short, thick; spikes stout .....*P. portulacoides*
2 Plant slender, leaves less than 1.5 cm long; internodes long, slender; spikes slender .....*P. heyneana*

Peperomia heyneana Miq., Syst. Pip. 123. 1843; Gamble, Fl. Madras 1210(847). 1925.

Slender annual epiphytes with long internodes. Leaves opposite, rarely whorled, petiolate, less than 1.5 cm long. Spike simple, glabrous; bracts small.

North E. India, South W. India. Fairly common in Ghats, on shaded

tree trunks. April-September. *CJS* 14753.

Peperomia portulacoides (Lam.) A. Dietr., Sp. Pl. 1: 172. 1831; Wight, Ic. t. 1922. 1853; Gamble, Fl. Madras 1211(847). 1925. *Piper portulacoides* Lam., Tab. 1: 82. 1791.

Perennials. Stem tufted. Leaves opposite and whorled, petiolate, more than 1.5 cm long. Spike simple or compound, glabrous. Bracts larger, with numerous brown dots.

Madagascar to South W. India. Common in Ghats. In shade, on trees. May-October. *CJS* 17953, *HFP* 1646.

Peperomia reflexa A. Dietr., Sp. Pl. 180. 1831; Gamble, Fl. Madras 1211(847). 1925.

Slender epiphytes with ternate leaves; spike hairy, simple or compound.

Paleotropics. Occasional in western plains (Byra). February. *CJS* 12851.

PIPER Linnaeus

Climbing shrubs rooting at nodes (rarely erect). Leaves alternate with deciduous stipules, petioled, often oblique at base, palmately ribbed. Inflorescence unisexual, leaf-opposed. Flowers small, rarely bisexual, bracteate. Stamens 2-4; pistillode 0. Stigmas 2-5, sessile or on short style. Fruit a berry.

1 Flowers enclosed in globose sacs of connate bracts.....*P. trichostachyon*
1 Flowers not enclosed in sacs.
2 Petiole and peduncle with spreading hairs.....*P. hymenophyllum*
2 Petiole and peduncle without spreading hairs.
3 Bracts imbricating to cover the flowers.....*P. trioicum*
3 Bracts not imbricating; flowers exposed.
4 Leaves with at least a pair of clearly pinnate ribs, without scales beneath.....*P. nigrum*
4 Leaves with five basal ribs and silvery scales on lower surface.....*P. argyrophyllum*

Piper argyrophyllum Miquel, Syst. Pip. 330. 1844; Gamble, Fl. Madras 1207(845). 1925.

Slender climber. Petioles glabrous; leaves membranous, 5-ribbed from base, covered with silvery scales on lower surface. Spikes glabrous, to 20 cm in fruit; bracts glabrous, sessile, adnate to axis by middle.

Western India, Sri Lanka. On trees in lower Ghats. June-September. *HFP* 2866.

Piper hymenophyllum Miq., London J. Bot. 5: 554. 1846; Wight, Ic. t. 1942. 1853; Gamble, Fl. Madras 1207(845). 1925.

Leaf and petiole hairy; blade ovate, acuminate, to 14×6.5 cm,

palmately 5-ribbed, membranous. Bracts peltate with overlapping margins. Berry more or less ellipsoid.

South W. India. Common in upper Ghats, occasional in lower Bisle Ghat, on trees. February-September. *CJS* 16753, *HFP* 2866.

Piper nigrum L., Sp. Pl. 28. 1753; Gamble, Fl. Madras 1206(845). 1925.

Leaves ovate, acuminate, to 18×1.2 cm, 5-7-ribbed, chartaceous. Bracts forming cup below partially exposed flowers. Berry globose.

Native of the Eastern and Western Ghats in India, cultivated in the Tropics. In Ghats, on forest trees. January-September. *CJS* 12599, 14634. Wild, also cultivated for the spice, black pepper.

Piper trichostachyon (Miq.) C. DC. in DC., Prodr. 16(1): 242. 1869; Wight, Ic. t. 1944. 1853; Gamble, Fl. Madras 1205(844). 1925. *Muldera trichostachya* Miq., London J. Bot. 5: 556. 1846.

Large woody climber. Leaves narrow-elliptic, acuminate, 5-ribbed. Inflorescence pubescent or downy; flowers in cups of connate bracts. Berry yellow when ripe.

South W. India. Common in Ghats. All seasons. *CJS* 12247, *HFP* 1598.

Piper trioicum Roxb., Fl. Ind. 1: 151. 1820; Subramanyam & Henry, Bull. Bot. Surv. India 12: 4. 1972. *Piper attenuatum* Ham. ex Miq., Syst. Pip. 306. 1843, non Herb. ex Link. 1820; Gamble, Fl. Madras 1207(845). 1925. *Piper sylvestre* sensu Wight, Ic. t. 1937. 1853, non Lam. 1791.

Leaves ovate, sometimes broadly so, acute, 5-7-ribbed, membranous to chartaceous, to 13.5×6.5 cm. Bracts adnate medianly to axis; margins free, overlapping to cover flowers. Flowers white. Berry globose.

Indomalaysia. Common in Ghats, on forest trees. June-February. *CJS* 13899, *HFP* 246.

8. ARISTOLOCHIACEAE

T. P. Ramamoorthy

Herbs or shrubs, often climbing from a woody base. Leaves alternate, estipulate, simple, entire or lobed, palmately veined. Inflorescence axillary or terminal, of fascicles, short racemes, or a solitary flower, usually bracteate. Flowers bisexual, pedicelled, regular or irregular. Perianth lobes 3, tubular or half-inflated and ventricose at base, variously free or united above. Stamens 6-numerous, free or adnate with the style and stigma (gynostemium); anthers extrorse, 2-celled, dehiscing longitudinally. Ovary inferior, 4-6-locular; ovules many, axile;

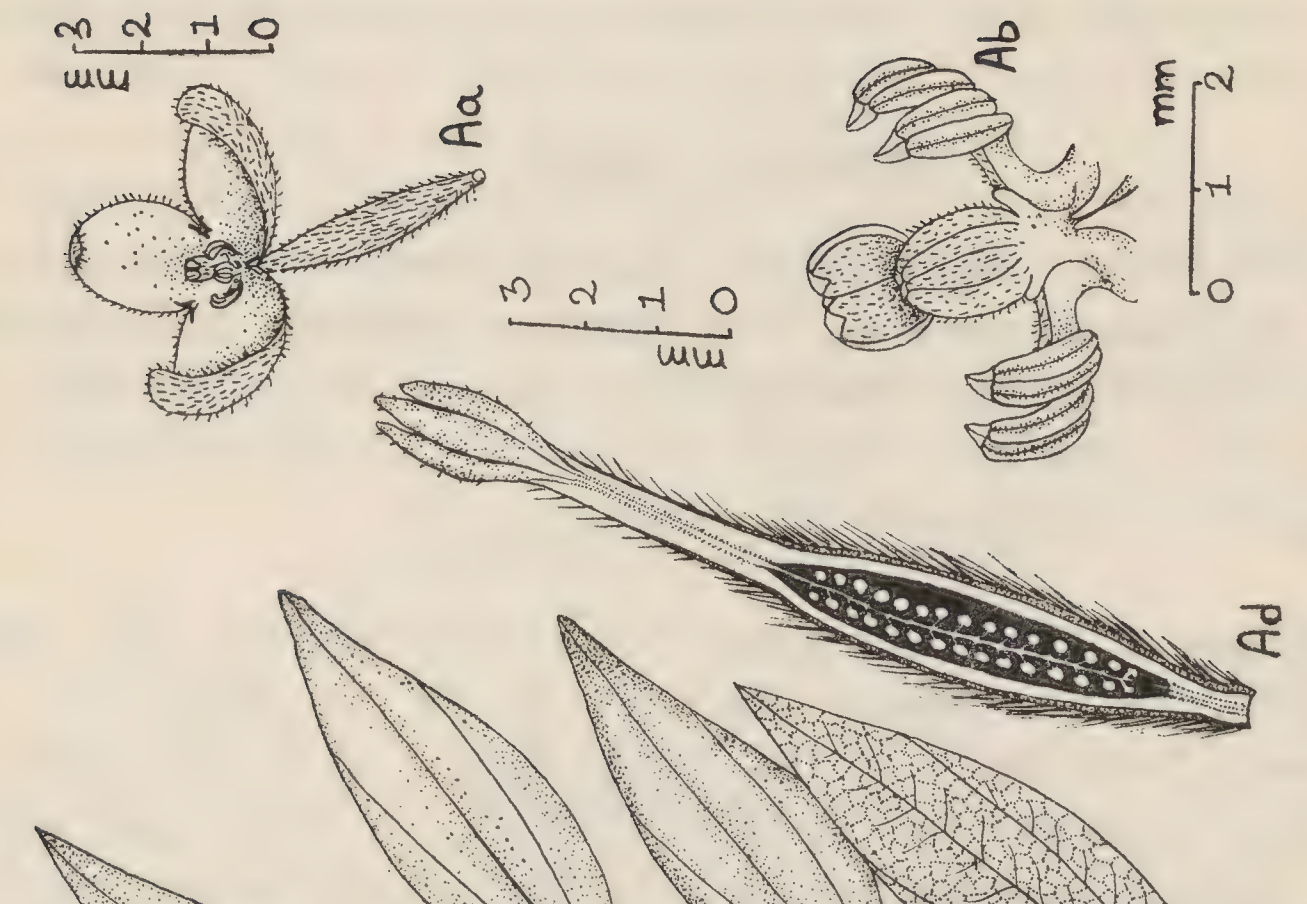


Fig. 9. ARISTOLOCHIACEAE. *A. Apama siliquosa*: flowering branch; *Aa*, flower; *Ab*, androecium with attached style; *Ac*, separated stamens; *Ad*, vertical section of immature fruit. *B. Aristolochia indica*: young fruit; *Ba*, dehisced fruit; *Bb*, seed.

style 1, 4-6-fid, shortly connate; stigmas inconspicuous. Fruit a 4-6-valved, many-seeded, septicidal capsule; seeds flat or trigonous, often winged.

1 Erect undershrubs; perianth tubular below, free above.....*Apama*
1 Herbaceous twiners; perianth inflated and ventricose in lower half, obliquely elongate above.....*Aristolochia*

APAMA Lamarck

Erect, subscandent undershrubs. Leaves usually triplinerved. Inflorescence of axillary cymes or short racemes. Flowers actinomorphic. Perianth lobes spreading. Stamens 6-12, free or in groups of 2 and adnate to style; connective slightly produced. Ovary 4-locular; style 4-fid. Capsule 4-valved; seeds not winged.

Apama siliquosa Lam., Encycl. 1: 91. 1783; Gamble, Fl. Madras 1200(840). 1925. *Bragantia wallichii* R. Br. ex Wight & Arn., Edinburgh New Philos. J. 181. 1833; Wight, Ic. t. 520. 1842.

Subscandent undershrubs. Leaves subsessile, to 22×6 cm, elliptic-lanceolate, acute, narrowed at base, sparsely hairy. Perianth lobes ovate-orbicular, acute, fleshy, externally hairy, dark purple. Stamens 6, in 3 groups of 2, adnate to style; anthers hairy. Fruit elongate, narrowly cylindrical; seeds 3-gonous, pitted.

Western Peninsular India, Sri Lanka. Common, in shade of forest undergrowth amidst boulders or on banks of forest streams. February-May. *CJS* 11761, *HFP* 1541.

ARISTOLOCHIA Linnaeus

Shrubs or twining herbaceous vines, perennating by subterranean rhizomes. Leaves petiolate, 3-7-ribbed; petiole sometimes dilated at base. Inflorescence of fascicled short racemes or of solitary flowers. Flowers bisexual, pedicelled, irregular. Perianth tubular, inflated below, constricted into a short or long neck bearing the 2-3-dentate, elongate lip. Stamens 6, sessile, fused with style; ovary 6-locular; style 6-fid. Fruit a 6-valved capsule; seeds flat, winged all around.

1 Leaves truncate to attenuate at base.....*A. indica*
1 Leaves deeply cordate at base.....*A. tagala*

Aristolochia indica L., Sp. Pl. 960. 1753; Gamble, Fl. Madras 1202 (841). 1925. *Aristolochia lanceolata* Wight, Ic. t. 1858. 1852.

Herbaceous twiners. Leaves to 12×2 cm, very variable, usually obovate, oblong to subpandurate, triplinerved. Flower tube inflated

or ventricose, greenish; limb purple or brown.

India, Sri Lanka. Common in plains and eastern hills, occasional in upper Ghats. The subterranean rhizome is used medicinally. July-January. *CJS* 15728, *HFP* 503.

Aristolochia tagala Cham., Linnaea 7: 207. 1832; Gamble, Fl. Madras 1202(841). 1925. *Aristolochia acuminata* Roxb., Fl. Ind. 3: 489. 1832, non Lam. 1783; Wight, Ic. t. 771. 1844.

A large climber. Leaves to 16×12 cm, ovate, acuminate, deeply cordate at base, 7-ribbed. Flowers usually purple.

Indomalaysia. Common in lower Ghats, in forest clearings or towards edges of semi-evergreen forests. All seasons. *CJS* 16001, *HFP* 2658.

9. NYMPHAEACEAE

K. N. Gandhi

NYMPHAEA Linnaeus

Aquatic, perennial, stoloniferous herbs. Leaves alternate, floating; stipules 0; blade simple, commonly dentate, peltate with a deep fissure at base; veins radiating from center, then bifurcating. Flowers solitary, regular, bisexual. Scape long, spongy. Perianth differentiated; sepals 4; petals many, arising from base of receptacle. Stamens many; filaments petaloid, broad at base, inserted towards upper edge of cupular receptacle; anthers linear, introrse. Pistil formed by the loosely united carpels, surrounded by the hollow receptacle, many-locular, with many laminal ovules; stigmas many, sessile, linear, radiating over the top of the ovary. Fruit a fleshy berry ripening under water; seeds many, arillate.

1 Leaves glabrous, entire to bluntly dentate. Day flowering.....*N. nouchali*
1 Leaves covered beneath by dense short hairs, sharply dentate. Night flowering.....*N. pubescens*

Nymphaea nouchali N. Burman, Fl. Ind. 120. 1768; Backer & Bakh. f., Fl. Java 1: 149. 1963. *Nymphaea stellata* Willd., Sp. Pl. 2: 1153. 1799; Wight, Ic. t. 178. 1839; Gamble, Fl. Madras 33(24). 1915.

Leaf blade entire to bluntly toothed, green above, pale-purple below, to 25×20 cm, glabrous. Sepals green, with purple dots; petals white. Staminal filaments yellow; anthers brown with creamy appendages; stigmas bright orange.

Tropics. Collected once in flower at Athihalli (Bisle Ghat) on May 9, 1970. October-May. Flowers open in morning and close by afternoon (day flowering). *HFP* 116.

Nymphaea pubescens Willd., Sp. Pl. 2: 1154. 1799; Gamble, Fl. Madras 34(24). 1915; Backer & Bakh. f., Fl. Java 1: 148. 1963. *Nymphaea nouchali* auct. non N. Burman. 1768: Sant., Fl. Khandala ed. 3, 5. 1967.

Leaf blade sharply dentate at margin, green above, brown and short hairy beneath, to 36×30 cm. Petals pink to white. Stamens with yellow filaments and anthers. Stigmas orange.

Tropics. Common in open tanks of the District. October-May. Flowers open in the evening and close late the next morning (night flowering). *CJS* 11227, 15789.

10. NELUMBONACEAE

K. N. Gandhi

NELUMBO Adanson

Aquatic, perennial, stoloniferous herbs. Leaves alternate, with long, fleshy, warty petiole; stipules 0; blade peltate, simple, entire, when mature emersed above water; veins radiating from the center, bifurcating. Flowers solitary, bisexual, regular, on long, spongy peduncle. Outer tepals greenish, caducous; inner tepals petaloid, many, deciduous. Stamens many; filaments slender; anthers linear, with clavate connective. Receptacle turbinate, fleshy. Pistils many, free, superior, ovoid, loosely embedded in pits of the flat top of receptacle; each 1-locular; ovule 1, pendulous; style short; stigma peltate. Fruit an aggregate of indehiscent, single-seeded nutlets.

Nelumbo nucifera Gaertner, Fruct. 1: 73. 1788; Subramanyam, Aquat. Angiosp. 8, f. 4. 1962. *Nymphaea nelumbo* L., Sp. Pl. 511. 1753. *Nelumbium speciosum* Willd., Sp. Pl. 2: 1258. 1799; Gamble, Fl. Madras 34(24). 1915. *Nelumbium nelumbo* (L.) Druce, Bot. Exch. Cl. Soc. Brit. Isles 3: 421. 1914.

Petiole up to 2 m long; leaf blade circular, waxy, glaucous beneath, up to 60 cm across. Peduncle to 2 m. Flowers to 25 cm across. Outer tepals greenish white. Inner tepals rosy white, yellow or white. Receptacle 5-8 cm across, fleshy. Ripened carpels nutlike.

Indomalaysia. Common in open tanks. May-November. This is the sacred lotus (Padma) of Vishnu. *HFP* 1831, 2043.

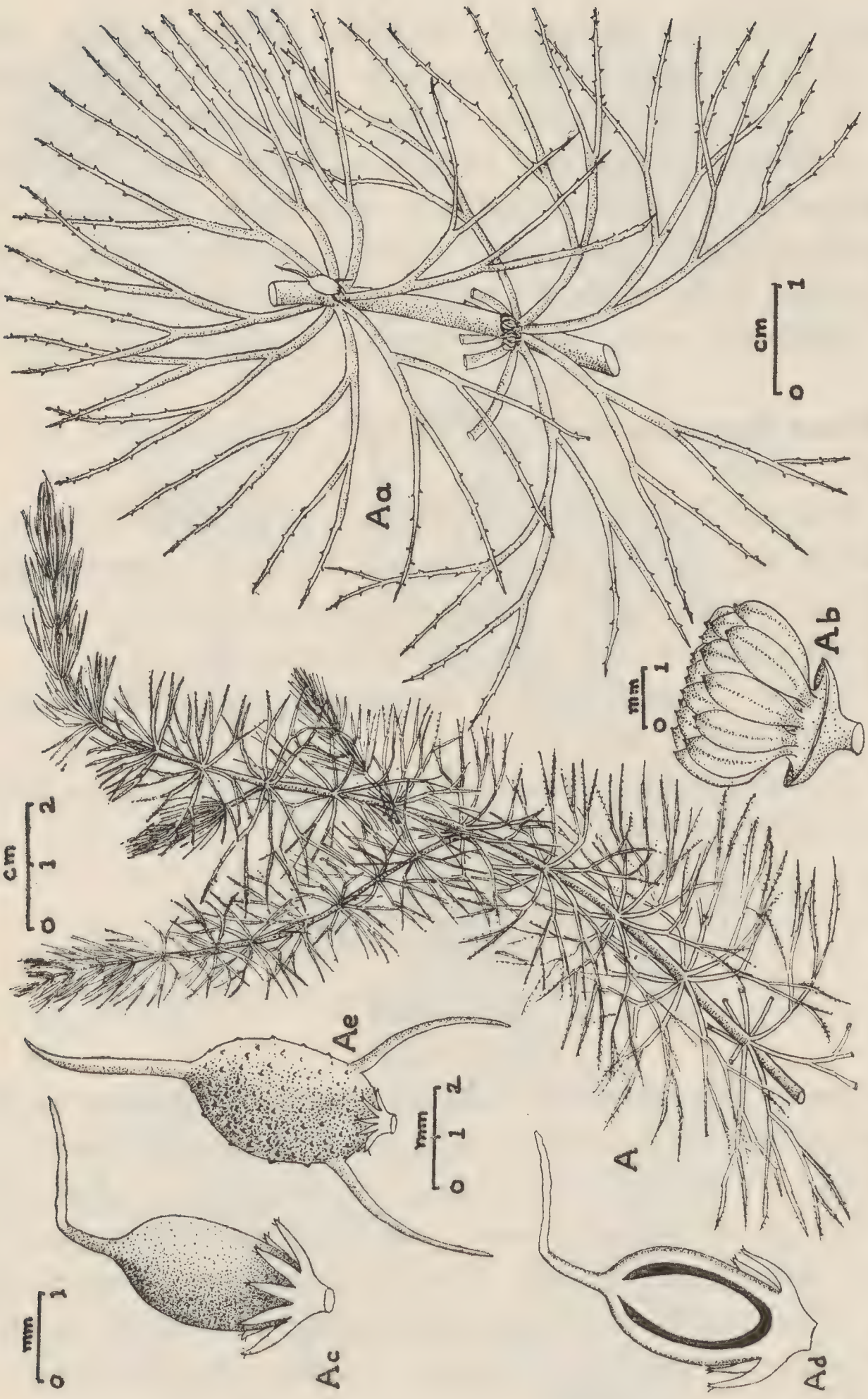


Fig. 10. CERATOPHYLLACEAE. *A. Ceratophyllum demersum*: habit; *Aa*, portion of stem; *Ab*, male flower without tepals; *Ac*, female flower; *Ad*, vertical section; *Ae*, fruit.

11. CERATOPHYLLACEAE

K. N. Gandhi

CERATOPHYLLUM Linnaeus

Submerged, slender, branched, rootless herbs. Leaves whorled, estipulate, dichotomously branching into toothed, linear segments. Flowers solitary, axillary, unisexual, regular. Perianth of 6-12, subulate to scale-like segments, persistent. Staminate flower with 12-30 stamens; anthers subsessile, 2-celled, minutely apiculate. Pistillode absent. Pistillate flower without staminodes. Ovary superior, sessile, 1-locular, with a pendulous ovule; style 1; stigma simple. Fruit a warty nutlet, tipped with persistent style, with or without 2 spines near base.

Ceratophyllum demersum L., Sp. Pl. 992. 1753; Gamble, Fl. Madras 1391(973). 1928.

Leaves 6-10 in a whorl, dichotomously forked, with 2-6 or more filiform, toothed segments, 1.5-4 cm long. Perianth segments greenish-white, slightly ciliate at apex. Fruits compressed, ovoid, 4-5 mm long, with 2 decurved spines at base, turning black with age.

Temperate areas to Tropics. Fairly common in tanks across the plain. All seasons. *CJS* 13430, *HFP* 2591.

Note: The specimens look like *Najas* L. in which the sheathing leaves are alternate to ternate and not dichotomously branching.

12. RANUNCULACEAE

K. N. Gandhi

Herbs, shrubs or woody vines. Leaves alternate, opposite or radical; stipules usually absent or represented by stipule-like petiolar sheaths; blade often compound; venation subpalmate or palmate. Inflorescence a panicle, raceme or of solitary flower, axillary and/or terminal; bracts and bracteoles sometimes present. Flowers bisexual or unisexual, regular or irregular. Perianth of free segments, usually in 1 whorl, sepaloid or petaloid, imbricate or valvate. Stamens 5-many, free, rarely the outer ones petaloid and staminodial; anthers 2-celled, basifixed. Pistils few-many, free or rarely partially coherent, superior, each 1-locular, with 1-many, marginal ovules; style simple, short or long, often accrescent; stigma simple. Fruit an aggregate of distinct achenes, follicles or berries.

1 Leaves alternate; petiole with stipule-like auricles. Erect herbs. . . . . **Thalictrum**
1 Leaves opposite; petiole without basal auricles. Climbers.

Fig. 11. RANUNCULACEAE. *A. Thalictrum dalzellii*: flowering branch; *Aa*, flower; *Ab*, fruit. *B. Naravelia zeylanica*: flower without tepals; *Ba*, fruit. *C. Clematis gouriana*: flower.

2 Terminal leaflet modified into a tendril. Petaloid staminodes present.....**Naravelia**
2 Terminal leaflet normal. Staminodes absent.....**Clematis**

CLEMATIS Linnaeus

Woody climbers, rarely erect shrubs or herbs. Leaves opposite, simple or compound; petiole often twining. Inflorescence a panicle or a solitary flower, axillary and terminal; bracts short, linear. Flowers bisexual or unisexual, regular. Perianth of 4-8, valvate, petaloid segments. Stamens many; filaments linear; anthers short. Pistils each with a pendulous ovule; styles pilose. Fruit an aggregate of sessile or stalked, ovoid achenes that are terminated with elongated, feathery styles.

1 Leaves 1-3-foliolate; leaflets more than 3 cm broad. Flowers up to 5 cm across; tepals maroon.....*C. smilacifolia*
1 Leaves many-foliolate; leaflets less than 2 cm broad. Flowers to 1.5 cm across; tepals white.....*C. gouriana*

Clematis gouriana Roxb. [Hort. Beng. 43. 1814, *nom.*] ex DC., Syst. 1: 138. 1817; Wight, Ic. t. 933-4. 1845; Gamble, Fl. Madras 3(2). 1915. *Clematis javana* DC., Syst. 1: 152. 1817; Backer & Bakh. f., Fl. Java. 1: 145. 1963.

Leaves generally bipinnate; leaf axis 10-12 cm long; leaflets petiolulate, almost entire, ovate, acuminate, 4-7×1.2-3 cm, veins distinct and hairy beneath, 3-5-ribbed. Inflorescence panicled, many-flowered. Flowers bisexual, to 1.2 cm across, white. Stamens glabrous. Achene style 4 cm long.

Indomalaysia. Common in upper Ghats and western plain. December-January. *CJS* 12229, 15805.

Clematis smilacifolia Wall., Asiat. Res. 13: 402. 1820; Gamble, Fl. Madras 3(2). 1915.

Petiole twining, 8-12 cm long; leaf blade 1-foliolate or 3-foliolate; leaflets entire or remotely serrate, ovate, acuminate, slightly cordate, 9-12×7 cm, thick, chartaceous; venation distinct, 7-ribbed. Flowers bisexual, usually in panicles, 3-4 cm across; peduncle 5 cm long, with distinct bracteoles below the middle. Perianth segments oblong, to 2.5×0.6 cm, maroon, velvety outside, glabrous within. Stamens white, glabrous; filaments uniform; connective produced beyond the anther. Achene style 5-7 cm long.

Indomalaysia. Rare; collected once in flower at Maranahalli (upper Shiradi Ghat) on December 17, 1969. *CJS* 15833.

NARAVELIA A. P. de Candolle

Woody climbers. Leaves opposite, pinnate; first pair of leaflets

normal, upper one(s) transformed into generally 3-fid tendril(s); leaflets entire. Inflorescence a panicle, axillary and terminal; bracts and bracteoles present. Flowers bisexual, regular. Sepaloid segments 4-5, caducous. Petaloid staminodes 10-14, linear to club-shaped, elongating after the fall of perianth. Stamens many; filaments short; anthers linear; connective produced beyond the anthers. Achenes clustered, short-stalked, linear, twisted or not at apex, terminated by elongated, feathery style.

Naravelia zeylanica (L.) DC., Syst. 1: 167. 1817; Gamble, Fl. Madras 3(3). 1915. *Atragene zeylanica* L., Sp. Pl. 542. 1753.

Young parts downy. Leaves trifoliolate; petiole 6-10 cm long, petiolule 2 cm long; lateral leaflets broadly ovate, abruptly acute at apex, rounded at base, 12-14 × 9 cm, downy beneath, glabrous above, 5-ribbed; terminal tendril 10-12 cm long. Flowers 1.5 cm across. Perianth green. Petaloid staminodes greenish-yellow, glabrous. Fruit style feathery, twisted, to 3 cm long.

Himalayas to Sri Lanka. Scattered across the Ghats. November-February. *HFP* 1149, 1355.

THALICTRUM Linnaeus

Branched, slender herbs, with rhizomatous rootstock. Leaves alternate; petiole with stipule-like auricles; blade compound. Inflorescence a raceme or panicle, subterminal and terminal; bracts foliar, small. Flowers usually bisexual, regular. Perianth of 4-5, linear, often petaloid segments, imbricate in bud. Stamens many; filaments linear; anthers linear, shorter. Style short, hooked, persistent or deciduous. Fruit an aggregate of sessile or stalked, ribbed or winged achenes.

Thalictrum dalzellii W. Hooker, Ic. Pl. t. 868. 1852; Gamble, Fl. Madras 4(3). 1915.

Herbs to 40 cm. Leaves trifoliolate or biternate; main axis 5 cm long; petiolule 1 cm long, filiform; leaflets 3 or 9, reniform or suborbicular, lobed, to 2.5 × 3 cm, membranous. Panicle few-flowered, small. Flowers white, 1 cm across; pedicels 1.5-2.5 cm long, filiform. Achenes many, sessile, compact, oblong, ribbed, hooked at the tip.

Western Ghats. Locally common at peak of Vanagur (upper Bisle Ghat) c. 1100 m. August-September. *HFP* 737, 1989.

13. MENISPERMACEAE

K. N. Gandhi

Erect, creeping, scandent or twining, dioecious herbs or shrubs, rarely trees. Leaves alternate; stipules 0; blade simple, rarely compound, entire or lobed; venation usually palmate. Inflorescence mostly of axillary racemes, cymes or panicles; bracts small or foliaceous; bracteoles short. Flowers unisexual, regular or irregular, 2-3-merous, small. Perianth free or connate, 2-many-seriate, differentiated into calyx and corolla or undifferentiated. Stamens 2-many; filaments free or variously connate into an androphore; anthers 2-celled or spuriously 4-celled, dehiscing vertically or transversely. Pistillode small or 0 in staminate flower. Staminodes 6 or 0 in pistillate flower. Pistils 1 or 3 (—6), free, superior, 1-locular, with solitary, ventral ovule; style(s) typically subbasal due to curvature of ovary, short; stigmas entire or deeply lobed. Fruit a simple drupe or an aggregate of few drupelets, often compressed typically with subbasal style scar; endocarp variously ornamented; seeds reniform or curved.

1 Inflorescence arising directly from old wood.
2 Stamens connate. Drupelets subglobose. Leaves with bearded acarodomatia in lower axils of prominent nerves..... **Anamirta**
2 Stamens free. Drupelets compressed. Leaves without acarodomatia....**Diploclisia**
1 Inflorescence from leaf axils.
3 Inflorescence of compound umbels. Leaves glabrous. Stamens connate, pistil solitary..... **Stephania**
3 Inflorescence not of compound umbels. Leaves pubescent on one or both surfaces.
4 Stamens free. Pistils 3-6..... **Cocculus**
4 Stamens connate. Pistil solitary.
5 Leaves as long as broad. Staminate flowers polysepalous. Pistillate inflorescence with conspicuous bracts..... **Cissampelos**
5 Leaves longer than broad. Staminate flowers gamosepalous. Pistillate inflorescence without conspicuous bracts..... **Cyclea**

ANAMIRTA Colebrooke

Woody climbers. Leaves coriaceous, alternate; petiole visibly swollen at base; blade not peltate, entire, rounded or subcordate at base. Inflorescence a panicle from the nodes of old wood. Flowers pedicelled. Perianth segments 6-12, imbricate, sepaloid. Stamens many, connate; anthers capitate on top of staminal column, dehiscing transversely. Staminodes 6 in pistillate flower, in single whorl, minute. Pistils 3-6, on a short 3-6-fid gynophore; stigmas subsessile, reflexed, subcapitate; gynophore gland-dotted at apex. Drupelets 1-5, obliquely ovoid.

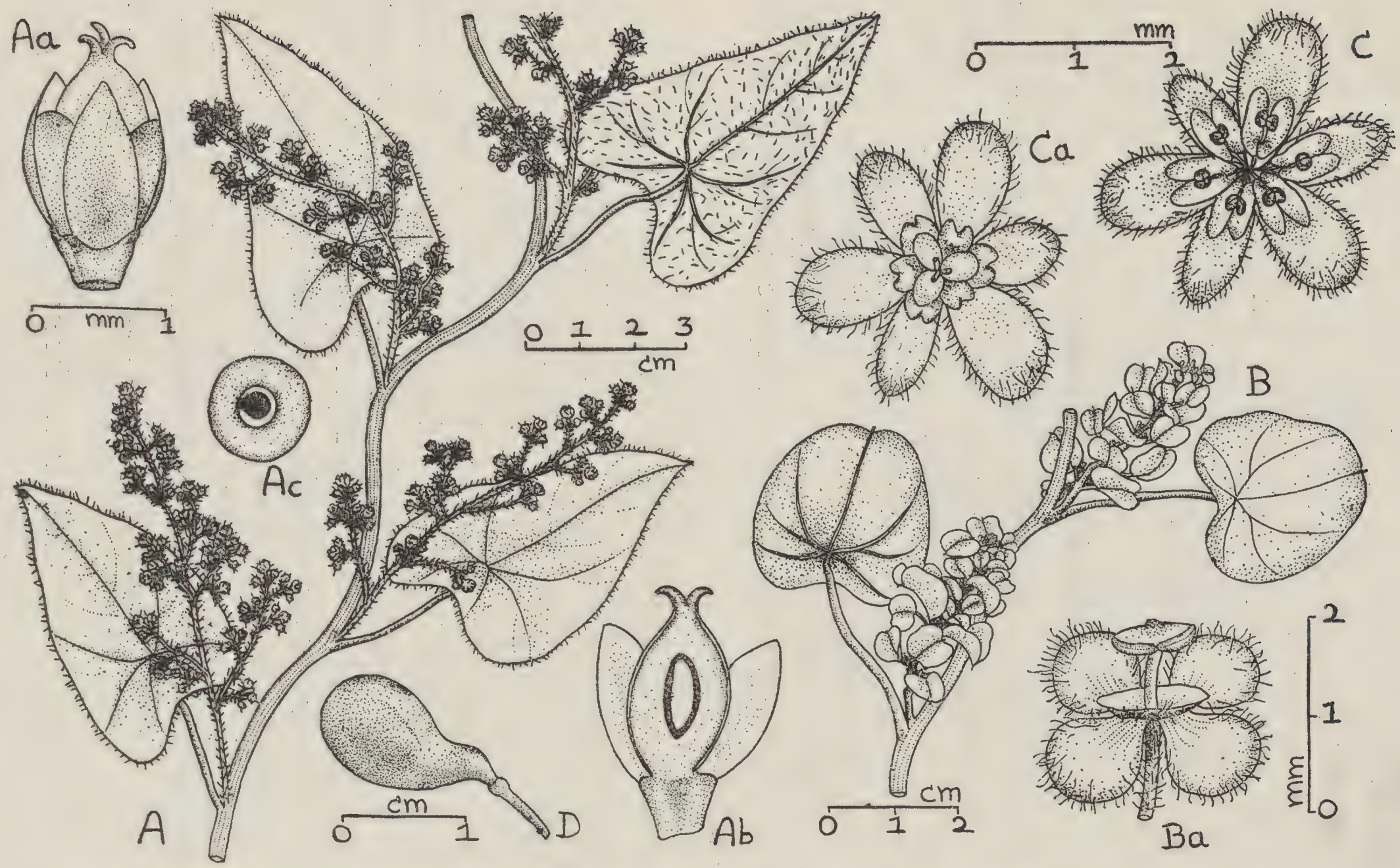


Fig. 12. MENISPERMACEAE. *A. Cyclea peltata*: staminate flowering branch; *Aa*, *Stephania japonica*: female flower; *Ab*, same, vertical section; *Ac*, same, transverse section. *B. Cissampelos pareira* var. *hirsuta*: female flowering branch; *Ba*, male flower. *C. Cocculus hirsutus*: male flower; *Ca*, female flower. *D. Diploclisia glaucescens*: fruit.

Anamirta cocculus (L.) Wight & Arn., Prodr. 446. 1834; Gamble, Fl. Madras 28(19). 1915; Kirtikar & Basu, Ind. Med. Pl. 52, t. 36. 1918. *Menispermum cocculus* L., Sp. Pl. 340. 1753.

Glabrescent climbers. Petiole 8-12 cm long; leaf blade ovate, obtusely acute at apex, truncate or shallowly cordate at base, 10-15 × 7-11 cm, chartaceous, with many bearded acarodomatia in axils of strong nerves beneath. Panicles drooping. Flowers with 6 greenish-white tepals. Drupelets white, turning purple with age, 1 cm across.

Indomalaysia. Collected once in fruit at Kempuhole (lower Shiradi Ghat) on April 11, 1969. *CJS* 16819.

CISSAMPELOS Linnaeus

Twining or suberect herbs or shrubs. Staminate inflorescence: cymes often paniculate; bracts minute; flowers regular, pedicelled; sepals 4, free; petals 2-4, connate, almost cupular; stamens 4, connate, anthers forming a terminal ring (synandrium), dehiscing transversely. Pistillate inflorescence: panicle with flowers fascicled in the axils of many foliaceous bracts; flowers irregular, pedicelled; sepal 1; petal 1, opposite to sepal and shorter; pistil 1, villous; style shortly 3-fid. Drupe compressed; endocarp tubercled along the sides.

Cissampelos pareira L., Sp. Pl. 1031. 1753.

var. **hirsuta** (DC.) Forman, Kew Bull. 22: 356. 1968.

Cissampelos hirsuta Ham. ex DC., Syst. 1: 535. 1817. *Cissampelos orbiculata* DC., Syst. 1: 537. 1817. *Cissampelos convolvulacea* var. *hirsuta* (DC.) Hassk., Pl. Jav. Rar. 171. 1848. *Cissampelos pareira* var. *orbiculata* (DC.) Miq., Ann. Mus. Lugd.-Bat. 4: 85. 1868; Troupin, Bull. Jard. Bot. Brux. 25: 140. 1955. *Cissampelos pareira* L. *pro parte*: Gamble, Fl. Madras 30(21). 1915.

Softly tomentose, herbaceous climbers. Petiole to 2.5 cm long; leaf blade ovate-to-orbicular, apiculate, peltate-cordate at base, 2.5-5.5 × 2.5-4 cm, densely hairy beneath; venation obscure. Pistillate inflorescence longer than staminate inflorescence, with many conspicuous, imbricate bracts. Flowers greenish-white. Drupes scarlet, tomentose, 2-3 mm long.

Tropics. Occasional in dry deciduous forests across the plain. June-September. *HFP* 498, 2823.

COCCULUS A. P. de Candolle *nom. cons.*

Climbers, shrubs or trees. Leaves not peltate, entire or lobed, membranous. Inflorescence a panicle, fascicle or flowers solitary;

bracts foliaceous. Flowers pedicelled. Sepals usually 6, free, imbricate, inner whorl larger. Petals 6, opposite and usually smaller than sepals, generally auricled at base, 2-fid at apex, embracing the stamens and staminodes at base. Stamens 6, free; anthers dehiscing vertically. Pistillode absent in staminate flower. Staminodes 6 or 0 in pistillate flower. Pistils 3-6; styles usually cylindric. Endocarp with transverse ridges along the sides.

Cocculus hirsutus (L.) Diels in Engl., Pflanzenr. 46: 236. 1910; Gamble, Fl. Madras 29(21). 1915. *Menispermum hirsutum* L., Sp. Pl. 341. 1753.

Pubescent, climbing herbs. Petiole 1-1.5 cm long; leaf blade ovate, obtuse at apex, rounded at base, densely pubescent beneath, to 4.5×3 cm. Staminate flowers in slender panicles. Pistillate flowers in fascicles. Drupelets reddish-purple, 2-3 mm long.

Tropical Africa and India. Common across plain. December-April. *CJS* 12392, *HFP* 1417.

CYCLEA Arnott ex Wight

Climbing or subscandent herbs or shrubs. Leaves usually peltate, entire, membranous. Inflorescence a panicle. Staminate flower regular; calyx usually gamosepalous, campanulate, 4-6-lobed; petals 4-8, connate or free, rarely absent; stamens 4-8, connate; anthers united into a ring at the top of the staminal column, dehiscing transversely. Pistillate flower irregular; sepal usually 1; petal 1, attached to the base of the sepal, smaller or equal; pistil 1, villous; style deeply trifid. Endocarp with transverse ridges.

Cyclea peltata (Lam.) J. Hooker & Thoms., Fl. Ind. 201. 1855; Gamble, Fl. Madras 31(22). 1915; Sant. & Janardhanan, Bull. Bot. Surv. India 10: 368. 1969. *Menispermum peltatum* Lam., Encycl. 4: 96. 1797. *Cyclea burmanni* J. Hooker & Thoms., *l.c.*; Sant., Fl. Khandala ed. 3, 5. 1967.

Herbaceous twiners; stem sparsely pubescent. Petiole 1.5-2 cm long; leaf blade ovate, acute, broadly and slightly hastate at base, shining above, pubescent beneath, 7-14×4-9 cm. Panicle pubescent, slender, staminate one longer. Staminate flower: calyx lobes shorter than tube; petals connate into a rim. Pistillate flower: sepal oblong; petal orbicular. Drupes white, 4-5 mm long, glabrescent with age.

Western Ghats. Occasional in upper Ghats and western plain. All seasons. *CJS* 13385, *HFP* 2653.

DIPLOCLISIA Miers

Shrubby climbers. Leaves entire, peltate-cordate. Inflorescence a panicle, drooping from nodes of old wood. Sepals 6, free, inner whorl slightly larger. Petals 6, free, smaller than sepals, auricled, embracing the stamens or staminodes. Stamens 6, free; anthers globose, dehiscing vertically. Staminodes present in pistillate flower. Pistils 3, free, on a short gynophore, glabrous; styles eccentric. Drupelets compressed; endocarp with a septum-like structure in the middle of locule, transversely ridged on the sides.

Diploclisia glaucescens (Blume) Diels in Engl., Pflanzenr. 46: 225. 1910; Gamble, Fl. Madras 28(20). 1915. *Cocculus glaucescens* Blume, Bijdr. 25. 1825.

Large glabrous climber. Petiole 6-11 cm long. Leaf blade suborbicular or broadly ovate, obtuse at apex, truncate-cordate at base, 5-8×5-11 cm, shining above, glaucous beneath. Flowers yellow. Drupelets obovoid, 2-2.5 cm long, glaucous, becoming reddish with age.

Indomalaysia, China. Scattered across the Ghats. March-July. *CJS* 13770, *HFP* 2701.

STEPHANIA Loureiro

Slender climbers. Leaves peltate, entire, usually rounded, membranous. Inflorescence of sessile flowers in solitary or umbellate heads. Staminate flowers: sepals 6-10, free, ovate or obovate; petals 3-5, smaller than sepals; stamens monadelphous with anthers 6, connate into a terminal ring on the staminal column, dehiscing transversely. Pistillate flowers: sepals 3-5, free; petals 3-5, free, smaller than sepals; pistil 1, ellipsoid, glabrous; style deeply 3-fid; stigmas radiating. Endocarp with transverse ridges along sides.

Stephania japonica (Thunb.) Miers, Ann. Mag. Nat. Hist. ser. 3, 18: 14. 1866; Gamble, Fl. Madras 29(21). 1915; Forman, Kew Bull. 11: 49. 1956. *Menispermum japonicum* Thunb., Fl. Jap. 193. 1784.

Petiole 4-6 cm long; leaf blade ovate, acuminate, sometimes shallowly cordate at base, glabrous, to 11×7 cm. Umbels of 3-6 heads; peduncle 1.5-2 cm long. Flowers greenish-yellow. Drupes 0.5 cm long, red.

Tropical to Temperate Asia. Occasional in upper Ghats. March-August. *CJS* 14206, *HFP* 2725.

14. SABIACEAE

K. N. Gandhi

MELIOSMA Blume

Trees or shrubs, usually brown-pubescent. Leaves alternate, estipulate, simple or odd-pinnate; leaflets subopposite, terminal leaflet sometimes absent; venation pinnate. Inflorescence usually terminal panicle of cymes; bracts caducous. Flowers bisexual, irregular. Sepals 5 (often less), sometimes more by addition of sepal-like empty bracts, slightly connate at base. Petals 5, free; 3 large, unequal, suborbicular; 2 small, equal, usually bifid. Androecium often hooded over the pistil. Stamens 5; 2 fertile, opposite and attached to the bifid petals; filaments short, terminating in a cup bearing 2, generally globose, transversely dehiscent anther cells; 3 staminodial, opposite large petals. Disc generally present, thin, cupular, with 3-8 simple or dentate teeth. Ovary superior, sessile, usually 2-locular with 2 axile ovules per locule; style simple or bifid. Fruit a drupe, 1-seeded.

1 Leaves many-foliolate ..... *M. pinnata*
1 Leaves simple ..... *M. simplicifolia*

Meliosma pinnata (Roxb.) Walp., Rep. 1: 423. 1842; *Millingtonia pinnata* Roxb., Fl. Ind. 1: 103. 1820.

ssp. **arnottiana** (Wight) Beusekom, Blumea 19: 499. 1971. *Sapindus microcarpa* Wight & Arn., Prodr. 112. 1834, non Ruiz & Pavon, 1804. *Millingtonia arnottiana* Wight, Ill. 1: 144, t. 53. 1840. *Meliosma arnottiana* (Wight) Walp., Rep. 1: 423. 1842; Bedd., Fl. Sylv. t. 160. 1871; Gamble, Fl. Madras 256(183). 1918.

Leaf rachis to 18 cm; leaflets 9-15, subopposite, entire, elliptic-oblong or ovate, acuminate or cuspidate, rounded at base, to 16×5 cm, chartaceous. Panicle to 25 cm long. Flowers subsessile, crowded. Corolla white; ovary hairy. Stone almost smooth.

Indomalaysia, China. Fairly common in upper Ghats. April-August. *CJS* 13257, 14478.

Meliosma simplicifolia (Roxb.) Walp., Rep. 1: 423. 1842; Gamble, Fl. Madras 256 (182). 1918. *Millingtonia simplicifolia* Roxb., Pl. Cor. t. 254. 1820.

1 Sepals 6-13 ..... ssp. *pungens*
1 Sepals 4-5 ..... ssp. *simplicifolia*

ssp. **pungens** (Wight & Arn.) Beusekom, Blumea 19: 466. 1971. *Millingtonia pungens* Wall. ex Wight & Arn., Edinburgh New Philos.

Fig. 13. SABIACEAE. *A. Meliosma simplicifolia* ssp. *simplicifolia*: flowering branch; *Aa*, flower, vertical section; *Ab*, stamen with bifid petal; *Ac*, larger petal with staminode; *Ad*, fruit. *B. Meliosma pinnata* ssp. *arnottiana*: flower; *Ba*, ovary.

J. 15: 178. 1833. *Meliosma pungens* (Wight & Arn.) Walp., Rep. 1: 423. 1842. *Meliosma wightii* Planchon ex Brandis, For. Fl. 116. 1874; Gamble, Fl. Madras 256(182). 1918.

Leaves simple; petiole 2-4 cm long; blade remotely serrate, elliptic-lanceolate, acuminate, base acute-rounded. Panicle 20-30 cm long. Sepals 6-13. Petals white. Stone rugose.

South W. India, Sri Lanka. Occasional; collected once in flower at stream between Devalkere and Devarunde on May 29, 1969. *CJS* 13723.

ssp. **simplicifolia** Beusekom, Blumea 19: 476. 1971.

Leaves simple; petiole 3 cm long; blade entire, obovate or oblanceolate, abruptly acute at apex, cuneate, to 24×9 cm, chartaceous. Panicles clustered at apex. Flowers numerous, lax or crowded, sessile. Sepals 4-5. Corolla white. Stone rugose.

Indomalaysia, China. Fairly common in upper Shiradi Ghat. December-May. *CJS* 12272, *HFP* 81.

15. PAPAVERACEAE

K. N. Gandhi

ARGEMONE Linnaeus

Woody, armed, with yellow sap. Leaves alternate; stipules 0; blade simple; venation pinnate. Flowers solitary, terminal, subtended by 3 persistent, foliaceous bracts, shortly peduncled, bisexual, regular. Sepals 3, free, each with dorsal, subapical horn, caducous. Petals 6, 2-seriate, free, imbricate, often crumpled in bud, obovate, obtuse. Stamens many. Ovary superior, spinous, 1-locular; ovules many, on 3-7 parietal placentas; stigma subsessile, 3-7-lobed, radiate. Fruit a capsule, 7-valved at apex, ovoid or oblong, spinous, many-seeded.

Argemone mexicana L., Sp. Pl. 508. 1753; Gamble, Fl. Madras 35(25). 1915.

Glaucous, branched, prickly herbs. Leaves pinnatifid, basal petioled and larger, upper sessile, clasping at base and smaller. Flowers 3-4 cm across, yellow. Capsule to 4×2 cm, glaucous-green, turning black with age.

Introduced. Run wild in waste land across the plain. Possibly all seasons. *CJS* 12381, 16045.

16. ULMACEAE

T. P. Ramamoorthy

Nonlactiferous trees or shrubs, rarely armed. Leaves alternate; stipules lateral, rarely intrapetiolar, free or basally connate, deciduous; blade simple, often serrate, sometimes basally oblique, pinnately or palmately veined. Inflorescence fasciculate, cymose, rarely subspicate, on new or old wood, rarely a solitary flower, ebracteate. Flowers polygamous, irregular. Tepals 4-8, usually 5, free, subvalvate or imbricate. Stamens 3-8, rarely 10, opposite tepals, erect in bud; anthers 2-celled, dehiscing longitudinally; pistillode 0 or of hairs. Ovary superior, 1-locular; ovule solitary, pendulous; style simple, with 2 stigmatose, lateral arms. Fruit a drupe or samara, indehiscent, 1-seeded.

1 Leaves palmately veined.
2 Leaves distinctly canescent beneath.....**Trema**
2 Leaves glabrous or slightly pubescent beneath.....**Celtis**
1 Leaves pinnately veined.
3 Flowers and leaves present simultaneously; ovary sessile; fruit a drupe....**Gironniera**
3 Flowers and leaves not present simultaneously; ovary stalked; fruit a samara...
.....**Holoptelea**

CELTIS Linnaeus

Deciduous trees. Leaves serrate or entire, palmately veined, with free stipules. Inflorescence of fascicles or cymes, at base of young shoots. Flowers distinctly pedicelled, females in upper axils. Tepals imbricate, ciliate, deciduous in female and bisexual flowers. Stamens 4-5, around a hairy torus; pistillode of hairs. Ovary sessile. Fruit a drupe.

1 Leaves distinctly oblique, serrate; midrib with prominent ascendingly pinnate veins in addition to basal 2.....*C. tetrandra*
1 Leaves nearly equal, entire; midrib without prominent ascendingly pinnate veins in addition to basal 2.....*C. wightii*

Celtis tetrandra Roxb., [Hort. Beng. 21. 1814, *nom.*] Fl. Ind. 2: 63. 1832; Gamble, Fl. Madras 1348(944). 1928. *Celtis serotina* Planchon, Ann. Sci. Nat. Bot. ser. 3, 10: 300. 1848; Wight, Ic. t. 1970. 1853.

Medium trees. Leaf to 10×4.5 cm, ovate, acute to shortly acuminate, distinctly oblique at base, serrate, with a few pinnate veins above basal veins. Pubescence on twigs grey.

Indomalaysia. A common roadside tree in upper Ghats, one of the first of deciduous trees to come into leaf. February-August. *CJS* 14600, *HFP* 207.

Celtis wightii Planchon, Ann. Sci. Nat. Bot. ser. 3, 10: 307. 1848;

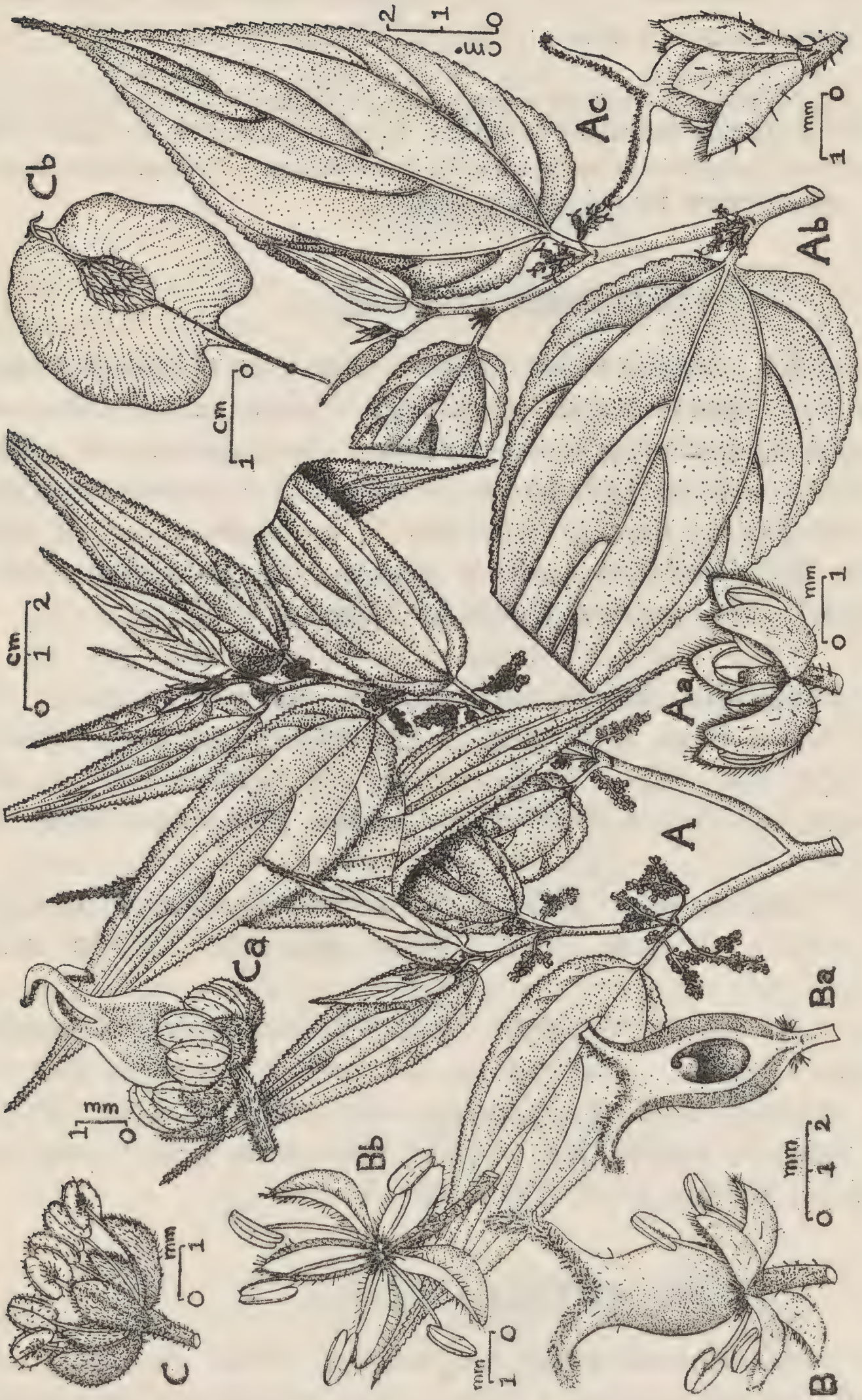


Fig. 14. ULMACEAE. *A. Trema orientalis*: male branch; *Aa*, male flower; *Ab*, female branch; *Ac*, female flower. *B. Celtis wightii*: bisexual flower; *Ba*, vertical section of ovary; *Bb*, male flower. *C. Holoptelea integrifolia*: male flower; *Ca*, bisexual flower; *Cb*, fruit.

Wight, Ic. t. 1969. 1853; Gamble, Fl. Madras 1349(944). 1928.

Medium trees. Leaf to 8×4 cm, ovate, acute, equal at base, entire, without any primary nerves above the basal 3. Pubescence of twigs ferruginous.

Indomalaysia to Australia. Common roadside trees in Ghats and in cardamum plantations. January-July. *CJS* 16600, *HFP* 2597.

Note: This resembles *Celtis cinnamomea* Lindl. and is distinguished from it by the equal leaf base, entire margin and the ciliate perianth. Gamble (*l.c.*) gives the color of twig pubescence as grey for *C. wightii* and ferruginous for *C. cinnamomea.* Our specimens have the characters of *C. wightii* except for pubescence color.

GIRONNIERA Gaudichaud

Trees or shrubs. Leaves equal at base, entire or distantly dentate, penninerved with lateral nerves ascending; stipules intrapetiolar, free or connate, usually sheathing buds, caducous. Inflorescence of solitary flowers (female), cymose, subspicate or fasciculate, axillary. Tepals imbricate, persistent in female. Stamens 5; pistillode a tuft of hairs. Ovary sessile, appressed-pubescent or glabrous; style central with 2 stigmatose arms. Fruit a drupe tipped by stigmas.

Gironniera cuspidata (Blume) Planchon ex Kurz, For. Fl. 2: 470. 1877; Backer & Bakh. f., Fl. Java 2: 12. 1965. *Cyclostemon cuspidatus* Blume, Bijd. 599. 1826. *Gironniera reticulata* Thwaites, Enum. 268. 1861; Bedd., Fl. Sylv. t. 313. 1873; Gamble, Fl. Madras 1349(944). 1928.

Large tree. Leaf entire, to 12.5×5 cm, oblong, lanceolate, caudate-acuminate; petiole 0.5 cm long. Ovary glabrous. Drupe ovoid, acute.

Indomalaysia. Occasional in upper Ghats (Yethinahalla, Devarunde), along the banks of rivers. The tree has not been collected in flower in the District, although fruiting specimens were collected from October to May. A valuable timber tree, yielding red-brown, heavy hardwood used for planking, rafting. *CJS* 13002, 13715.

HOLOPTELEA Planchon

Deciduous trees. Leaves entire, penninerved, with ascending side nerves; stipules lateral, scarious. Inflorescence fasciculate on previous year's shoots. Tepals imbricate, occasionally unequal. Stamens as many as tepals with hairy anthers. Ovary stipitate, compressed, tipped by stigmatic style arms. Fruit a samara; wing membranous or chartaceous, usually reticulate.

Holoptelea integrifolia (Roxb.) Planchon, Ann. Sci. Nat. Bot. ser. 3, 10; 269. 1848; Wight, Ic. t. 1968. 1853; Gamble, Fl. Madras 1348(943). 1928. *Ulmus integrifolia* Roxb., Pl. Cor. t. 78. 1798; Willd., Sp. Pl. 1: 1326. 1799; Bedd., Fl. Sylv. t. 310. 1873.

Leaf to 9×5 cm, elliptic, oblong, acute, glabrous. Flowers brownish. Wing of fruit emarginate at tip and crowned by persistent styles.

India, Indochina. Occasional in western plains. January-February. *CJS* 13019, 16315. The wood has an offensive smell when freshly cut.

TREMA Loureiro

Unarmed evergreen trees or shrubs. Leaves serrate, triplinerved; stipules small, lateral. Inflorescence cymose, axillary. Flowers shortly pedicelled, polygamo-dioecious. Tepals valvate and deciduous in male, imbricate and persistent in female, strongly convex on back; receptacle hairy. Stamens 4-5; pistillode of hairs. Ovary sessile; stigmas connate at base, undivided. Drupe small, subcompressed.

Trema orientalis (L.) Blume, Mus. Bot. 2: 61. 1856; Gamble, Fl. Madras 1350(945). 1925. *Celtis orientalis* L., [Fl. Zeyl. 176. 1747] Sp. Pl. 1044. 1753; Wight, Ic. t. 602, 603. 1842. *Sponia wightii* Planchon, Ann. Sci. Nat. Bot. ser. 3, 10: 322. 1848; Wight, Ic. t. 1971. 1853; Bedd., Fl. Sylv. t. 311. 1873.

Small trees, young parts pubescent. Leaves to 15×7 cm, ovate-lanceolate, acuminate, oblique, serrate, canescent beneath, scabrid above.

Indomalaysia. A common quick-growing tree along roads and forest clearings. January-October. *CJS* 12251, *HFP* 1780. Said to be excellent for charcoal for gun powder.

Note: This taxon is often confused with *Debregeasia longifolia* (Urticaceae) which can be recognized by its intrapetiolar (united) stipules on young growth.

17. MORACEAE

T. P. Ramamoorthy & K. N. Gandhi

Trees, shrubs or herbs, usually lactiferous, sometimes climbing, sometimes armed. Leaves usually alternate, with deciduous or persistent stipules, simple, entire or serrate, occasionally lobed, pinnately or palmately veined. Inflorescence usually cymose, sometimes densely spicate or flowers either on expanded or inside fleshy, hollow receptacles (figs), rarely solitary, axillary or cauliflorus. Flowers unisexual. Perianth of 1-4 segments, free or connate, sometimes absent. Stamens 1-4, sometimes more; pistillode absent or rudimentary. Ovary superior, tipped

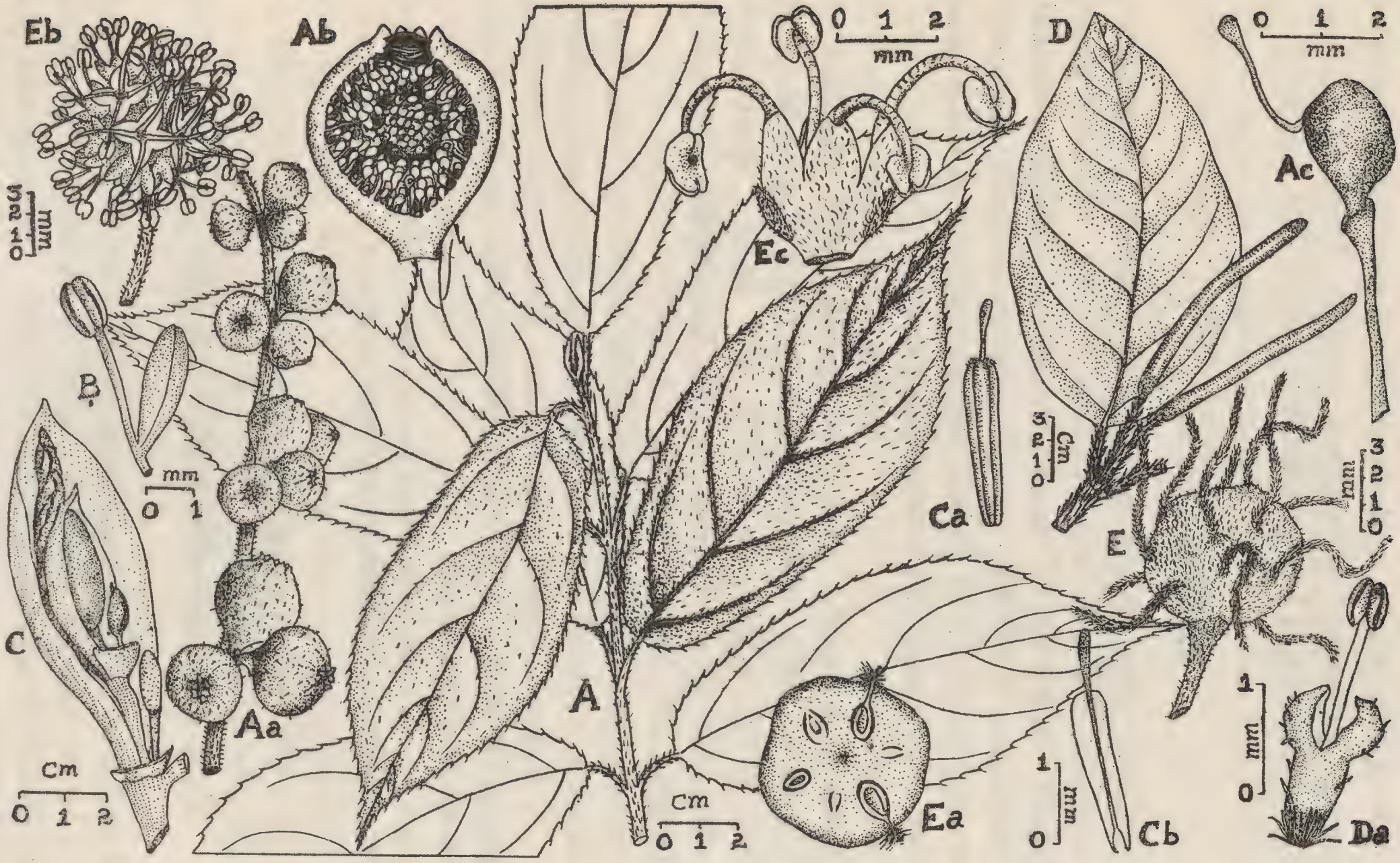


Fig. 15. MORACEAE. *A. Ficus hispida*: sterile branch; *Aa*, flowering branch; *Ab*, vertical section of fig; *Ac*, female flower with lateral style. *B. Ficus racemosa*: male flower. *C. Artocarpus heterophyllus*: female inflorescence; *Ca*, female flower; *Cb*, vertical section of female flower. *D. Artocarpus hirsutus:* male inflorescence; *Da*, male flower. *E. Plecospermum spinosum*: female inflorescence; *Ea*, same, cross section; *Eb*, male inflorescence; *Ec*, male flower.

by one (sometimes forking) or 2 styles, 1-locular, with one pendulous ovule. Fruit an achene or a simple drupe or multiple (by union into a syncarp) with fleshy perianth or with fleshy accrescent receptacle.

1 Armed scandent shrub.....**Plecospermum**
1 Unarmed trees or shrubs.
2 Inflorescence in a hollow receptacle (fig); flowers hidden.....**Ficus**
2 Inflorescence not in a hollow receptacle; flowers patent.
3 Fruit simple; pistillate flower solitary; staminate flower in heads of less than 10 flowers; stamens far exserted; sap clear.....**Streblus**
3 Fruit multiple; pistillate flowers in heads; stamen included; sap milky.....**Artocarpus**

ARTOCARPUS J. & G. Forster *nom. cons.*

Lactiferous, unarmed trees. Leaves alternate, with caducous large or small, amplexicaul stipules, short-petioled, simple, entire or pinnatifid, penninerved. Inflorescence cauliflorus or axillary, pedunculate, globose or ellipsoid, sometimes of elongate, dense spikes. Flowers dioecious. Perianth in male 2-4-fid, imbricate, sometimes tubular and bilobed, usually hairy; in female tubular, sunk in the inflorescence axis. Stamen 1; pistillode 0. Stigma single. Fruit usually an echinate, large syncarp with the fleshy (edible) perianths enclosing the seeds.

1 Plant glabrous.....*A. heterophyllus*
1 Branchlets, petioles and stipules hairy.
2 Nerves below yellow-hairy.....*A. hirsutus*
2 Nerves below grey-pubescent.....*A. gomezianus*

Artocarpus gomezianus Wall. ex Trecul, Ann. Sci. Nat. Bot. ser. 3, 8: 118. 1847.

ssp. **zeylanicus** Jarrett, J. Arnold Arbor. 61: 90. 1960. *Artocarpus lakoocha* sensu Gamble, Fl. Madras 1369(958). 1928, non Roxb., 1832.

Deciduous trees. Leaves entire, ovate-lanceolate, to 25×12 cm, grey pubescent beneath. Syncarp smooth, somewhat irregularly lobed with a 12-13 mm long peduncle.

South W. India, Sri Lanka. An occasional roadside tree in Ghats. Collected in fruit between March-June. The sour fruit is dried and used as a substitute for tamarind in curries. *CJS* 13204, *HFP* 238.

Artocarpus heterophyllus Lam., Encycl. 3: 210. 1789; Jarrett, J. Arnold Arbor. 60: 334. 1959. *Artocarpus integrifolius* sensu Gamble, Fl. Madras 1369(957). 1928, non L. f., 1781.

Large glabrous trees. Leaves to 12×7.5 cm, entire, oblong. Stipules often to 8 cm, leaving an annular scar behind. Syncarp large, cylindrical

with numerous short, hard, greenish echinate processes.

Native to South W. India, common in tropics. Common in wet deciduous and semi-evergreen forests in Ghats, also in cultivation. December-June. Commonly known as Jack (English) or Halasu (Kannada). The fleshy, golden-yellow perianth is eaten. *CJS* 15762, 16918.

Artocarpus hirsutus Lam., Encycl. 3: 210. 1789; Gamble, Fl. Madras 1369(957). 1928; Wight, Ic. t. 1957. 1853.

Large trees. Branchlets rusty-hairy. Leaf blade to 25×10 cm, ovate-lanceolate, rounded at tip. Syncarp to 10×8 cm, cylindric-ellipsoid, echinate with long, soft, orange processes when ripe.

South W. India. Common. Large evergreen trees in semi-evergreen forests in Ghats. January-May. The fleshy perianth is edible. *CJS* 12423, *HFP* 1667.

FICUS Linnaeus

Lactiferous, erect or scandent shrubs or large trees, sometimes with aerial roots, often epiphytic when young. Leaves alternate, rarely opposite; stipules large, sheathing terminal buds, deciduous, leaving annular scars; blade simple, usually entire, pinnately and/or palmately nerved. Inflorescence a hypanthodium, variously arranged; receptacle (fig) flask-shaped, sessile or stalked, subtended by 3 bracts, provided with a terminal mouth closed by imbricate bracts. Flowers inside the mouth of the fig, unisexual, numerous, minute, sessile or pedicelled, of 4 kinds (staminate, pistillate, gall & neuter), often intermixed with scales and hairs, all the 4 types occur in the same receptacle or staminate and gall flowers on one set of receptacles and pistillate flowers (occasionally accompanied by neuter) on another set. Perianth segments 2-6, free or partly or fully connate, sometimes imperfect or absent. Stamens 1-2, rarely more, with oblong or ovoid, 2-celled anthers. Pistillode sometimes present. Staminodes absent in pistillate flower. Ovary sessile or stalked; style lateral; stigma various. Gall flowers similar to pistillate, but ovaries either empty or enclosing wasp pupae. Neuter flowers rarely present. Fruit a fleshy synconium (fig) of tiny drupes or achenes.

1 Leaves opposite.....*F. hispida*
1 Leaves alternate.
 2 Figs distinctly peduncled.
  3 Leaves scabrous above.
   4 Figs in pairs.....*F. tinctoria*
   4 Figs solitary.....*F. exasperata*
  3 Leaves not scabrous.
   5 Figs on separate, leafless, reduced branches.....*F. racemosa*

5 Figs axillary on the twigs.
6 Figs solitary.....*F. callosa*
6 Figs in pairs.....*F. nervosa*
2 Figs sessile or subsessile.
7 Leaves caudate.
8 Petiole 4 cm or less in length; cusp less than 2.5 cm long.....*F. talbotii*
8 Petiole 5 cm or more in length; cusp more than 2.5 cm long.
9 Leaf base truncate or slightly attenuate; cusp 6 cm long.....*F. religiosa*
9 Leaf base cordate; cusp 3 cm long.....*F. arnottiana*
7 Leaves not caudate.
10 Leaves densely tomentose beneath (lateral nerves 8-12 pairs).....*F. drupacea*
10 Leaves glabrous or slightly pubescent beneath.
11 Leaves obtuse or blunt at apex.
12 Lateral nerves 6-9 pairs, not very distinct from smaller nerves. Figs glabrous, to 0.6 cm across.....*F. microcarpa*
12 Lateral nerves less than 6 pairs, distinct from smaller nerves. Figs silky-pubescent, 1-2 cm across.....*F. benghalensis*
11 Leaves acute to acuminate at apex.
13 Figs 2-6 together on short persistent tubercles, flowering on old wood.....*F. tsjahela*
13 Figs in pairs, not on tubercles, flowering on new wood.
14 Figs sessile; bracts small, scarious.....*F. amplissima*
14 Figs on 0.5 cm pedicel; bracts distinct, not scarious.....*F. virens*

Ficus amplissima J.E. Sm. in Rees, Cyclop. 14: n. 1. 1810; Corner, Gard. Bull. Straits Settlem. 21: 11. 1965. *Ficus tsiela* Roxb. ex Ham., Trans. Linn. Soc. London 15(1): 149. 1826; Wight, Ic. t. 668. 1843; Bedd., Fl. Sylv. t. 314. 1873; King, Ann. Roy. Bot. Gard. (Calcutta) 1: 59, t. 74 & 84Z2. 1887-88; Gamble, Fl. Madras 1362(953). 1928.

Large, spreading trees, sometimes with aerial roots. Petiole 3 cm long; leaf blade ovate, slightly acuminate at apex, rounded or shortly cuneate at base, to 10×6 cm, glabrous, coriaceous with 3 basal nerves; lateral nerves 10-12 pairs, distinct beneath. Figs in axillary pairs, sessile, globular, glabrous, 1.5 cm across; basal bracts 4, small, scarious.

South India, Sri Lanka. Occasional along the road in plains and upper Ghats. Young leaves and hypanthodia in March. Fruits ripen April-October. *CJS* 11264, 12885.

Ficus arnottiana (Miq.) Miq., Ann. Bot. Lugd.-Bat. 3: 287. 1867; King, Ann. Roy. Bot. Gard. (Calcutta) 1: 56, t. 68 & 84V. 1887-88; Gamble, Fl. Madras 1363(953). 1928; Corner, Gard. Bull. Straits Settlem. 21: 11. 1965. *Urostigma arnottiana* Miq., London J. Bot., 6: 564. 1847.

Small trees. Petiole 6-14 cm; leaf blade broadly ovate, caudate, cordate at base, to 12×9 cm, glabrous, chartaceous; base 5-7-nerved; lateral nerves 8-12 pairs; cusp 3 cm long. Figs clustered on tubercles on stem, usually in the axils of fallen leaves, subsessile, glabrous, globose,

6-8 cm across, purple; basal bracts distinct, caducous.

South India, Sri Lanka. Occasional in plains and upper Ghats, on rocky ground. Fruits ripen February-April. *HFP* 193, 2825.

Ficus benghalensis L., Sp. Pl. 1059. 1753; King, Ann. Roy. Bot. Gard. (Calcutta) 1: 18, t. 13 & 81C. 1887-88; Gamble, Fl. Madras 1361(952). 1928; Corner, Gard. Bull. Straits Settlem. 21: 14. 1965. *Urostigma benghalense* (L.) Gasp., Nov. Gen. Fici 7. 1844; Wight, Ic. t. 1989. 1853.

Large trees with numerous aerial roots, sometimes spreading widely. Petiole 2-3 cm long; leaf blade elliptic-ovate-lanceolate, obtuse at apex, rounded at base, to 12×8 cm, glabrescent, coriaceous, with 5-7 basal nerves; lateral nerves 4-6 pairs, indistinct above. Figs in axillary pairs, sessile, globular, silky-pubescent, bright red when ripe, to 2 cm across; basal bracts round, well developed.

India, Pakistan. Widely cultivated. Fairly common across plains along the roads and occasional in Ghats. December-April. Fruits ripen April-June. *CJS* 12154, 12375.

Ficus callosa Willd., Mem. Acad. Roy. Sci. Hist. (Berlin) 102. 1798; King, Ann. Roy. Bot. Gard. (Calcutta) 1: 64, t. 84V2 & 85. 1887-88; Gamble, Fl. Madras 1364(954). 1928; Corner, Gard. Bull. Straits Settlem. 21: 29. 1965.

Large trees. Petiole to 4 cm long; leaf blade elliptic or ovate-lanceolate, subacute at apex, rounded at base, to 20×10 cm, shining, slightly scabrid beneath, coriaceous, with 3-5 basal nerves; lateral nerves 10-14 pairs. Figs solitary, axillary, distinctly peduncled, globular, rugose, 2-3 cm across, yellow; peduncle 1.5 cm long; basal bracts minute.

Indomalaysia. Collected oncein upper Bisle Ghat on March 14, 1969. Fruits ripen June-July. *CJS* 13040.

Ficus drupacea Thunb., Diss. Fic. 11. 1786.

var. **pubescens** (Roth) Corner, Gard. Bull. Straits Settlem. 17: 381. 1960; 21: 13. 1965. *Ficus mysorensis* var. *pubescens* Roth in Roemer & Schultes, Syst. Veg. 1: 508. 1817. *Ficus mysorensis* Heyne ex Roth, *l.c.*; King, Ann. Roy. Bot. Gard. (Calcutta) 1: 19, t. 14 & 81D. 1887-88; Gamble, Fl. Madras 1361(952). 1928.

Large trees; young branchlets, petiole brown-hairy. Petiole 2-3 cm long; leaf blade elliptic-ovate, abruptly acuminate, truncate-cordate, to 14×9 cm, tomentose beneath, coriaceous, with 3-5 basal nerves; lateral nerves 10-14 pairs. Figs in axillary pairs, sessile, densely tomentose when young, glabrescent later, warty, 2 cm long, yellow; basal bracts ovate, spreading, woolly, deciduous.

Sri Lanka to Laos. Frequent along roads on the plain. Fruits ripen

April-May. *CJS* 16710, *HFP* 2802.

Ficus exasperata Vahl, Enum. 2: 197. 1806; Corner, Gard. Bull. Straits Settlem. 21: 74. 1965. *Ficus asperrima* Roxb., [Hort. Beng. 103. 1814, *nom.*] Fl. Ind. 3: 554. 1832; Wight, Ic. t. 633. 1843; King, Ann. Roy. Bot. Gard. (Calcutta) 1: 80, t. 100. 1887-88; Gamble, Fl. Madras 1366(955). 1928.

Shrubs or small trees, young parts scabrid. Leaves subopposite to alternate; petiole to 1 cm long; blade minutely serrate, obovate-ovate or elliptic-oblong-lanceolate, abruptly acuminate, cuneate and often unequal, scabrid above, hispid beneath, triplinerved; lateral nerves 3-5 pairs. Figs axillary, solitary, distinctly peduncled, globular, pubescent, yellowish-red, 1.5 cm across; peduncle 1 cm long; bracts lateral, scattered, small.

East Africa, Arabia, South India, Sri Lanka. Occasional in upper Ghats. Fruits ripen March-April. *HFP* 2734, 2860.

Ficus hispida L. f., Suppl. 442. 1781; King, Ann. Roy. Bot. Gard. (Calcutta) 1: 116, t. 154. 1887-88; Gamble, Fl. Madras 1367(956). 1928; Corner, Gard. Bull. Straits Settlem. 21: 89. 1965. *Ficus oppositifolia* Roxb., Pl. Cor. t. 124. 1798; Wight, Ic. t. 638. 1843. *Ficus daemona* Koenig ex Vahl, Enum. 2: 198. 1806, Wight, Ic. t. 641. 1843.

Shrubs or small trees, all parts hispid; internodes hollow. Leaves opposite; petiole 2-4.5 cm long; blade oblong, abruptly acuminate at apex, truncate-cordate, to 20×8 cm, scabrid, membranous, often shining above, 3-5-nerved at base; lateral nerves 5-7 pairs. Figs clustered on the tubercles of the stem or on separate leafless branches forming racemes, peduncled, obovoid, pubescent, to 2 cm across; peduncle 0.51 cm long; bracts small, lateral.

Indomalaysia. Occasional across Ghats. December to October. *CJS* 12830, *HFP* 2727.

Ficus microcarpa L. f., Suppl. 442. 1781; Corner, Gard. Bull. Straits Settlem. 21: 22. 1965. *Ficus retusa* auct. non. L.: King, Ann. Roy. Bot. Gard. (Calcutta) 1: 50 t. 61 & 84P. 1887-88; Gamble, Fl. Madras 1362(952). 1928.

Large tree with few aerial roots. Petiole 1 cm long; leaf blade obovate, obtuse at apex, cuneate at base, to 7×5 cm, glabrous, shining, coriaceous, with 3-5 basal nerves; lateral nerves of 6-9 pairs, not very distinct from secondary nerves. Figs in axillary pairs, sessile, globular, to 0.6 cm across, glabrous, pink to purple when ripe; basal bracts conspicuous.

Indomalaysia. Occasional in upper Ghats. January-October. *CJS* 14536, 14796.

Ficus nervosa Heyne ex Roth, Nov. Pl. Sp. 338. 1821; King, Ann. Roy. Bot. Gard. (Calcutta) 1: 53, t. 65. 1887-88; Gamble, Fl. Madras 1364(954). 1928; Corner, Gard. Bull. Straits Settlem. 21: 31. 1965. *Ficus angustifolia* Roxb., Fl. Ind. 3: 554. 1832; Wight, Ic. t. 660. 1843.

Large trees. Petiole 3 cm long; leaf blade elliptic or oblanceolate, abruptly acuminate, truncate or rounded at base, glabrous, shining above, pale brown beneath, 18×8 cm, sub-coriaceous; venation distinct beneath with 3-5 basal nerves and 8-10 pairs of lateral nerves. Figs in axillary pairs, peduncled, subglobular, 1.5 cm across, glabrescent, orange or red when ripe; peduncle 0.8 cm long; basal bracts minute.

India to Vietnam. Occasional across the District. Fruits ripen February-March. *HFP* 126, 2726.

Ficus racemosa L., Sp. Pl. 1060. 1753; Corner, Gard. Bull. Straits Settlem. 21: 34. 1965. *Ficus glomerata* Roxb., Pl. Cor. t. 123. 1798; Wight, Ic. t. 667. 1843; King, Ann. Roy. Bot. Gard. (Calcutta) 1: 173, t. 218A. 1887-88; Gamble, Fl. Madras 1364(954). 1928.

Small or large trees with few, short aerial roots. Petiole to 3 cm long; leaf blade elliptic-lanceolate, obtuse or acute at apex and base, to 12×5 cm, chartaceous, glabrous, triplinerved; lateral nerves 5-6 pairs. Figs on short, warted, tubercled, leafless branchlets, peduncled, obovoid, pubescent, 2 cm across, reddish when ripened; peduncle 1 cm long; bracts lateral, at the middle of the peduncle, small.

Indomalaysia. Occasional across the District. All seasons. *CJS* 12361, 16729.

Ficus religiosa L., Sp. Pl. 1059. 1753; Bedd., Fl. Sylv. t. 314. 1873; King, Ann. Roy. Bot. Gard. (Calcutta) 1: 55, t. 67A & 84U. 1887-88; Gamble, Fl. Madras 1363(953). 1928; Corner, Gard. Bull. Straits Settlem. 21: 6. 1965. *Urostigma religiosum* (L.) Gasp., Ric. Caprif. 82, t. 7, f. 1-5. 1845; Wight, Ic. t. 1967. 1853.

Large trees, with or without aerial roots. Petiole slender, to 8 cm long; blade slightly repand along the margin, broadly ovate or suborbicular, caudate, truncate-acute at base, glabrous, chartaceous, to 12×11 cm, with 5-7 basal nerves and 8-10 pairs of lateral nerves; cusp 6 cm long. Figs in axillary pairs, sessile, tomentose when young, 1 cm across, dark purple when ripe; basal bracts distinct.

Indochina. Widely cultivated. Fairly common along the road across plains; usually cultivated near temples. March-May. *HFP* 183, 2801.

Ficus talbotii King, Ann. Roy. Bot. Gard. (Calcutta) 1: 51, t. 63 & 84Q. 1887-88; Gamble, Fl. Madras 1063(953). 1928; Corner, Gard. Bull. Straits Settlem. 21: 19. 1965.

Large trees, with few or no aerial roots. Petiole to 2.4 cm long; leaf blade elliptic-oblong, caudate at apex, acute-rounded at base,

glabrous, subcoriaceous, to 7×4.5 cm, with 3-5 basal nerves and 8-10 pairs of primary lateral nerves. Figs in axillary pairs, subsessile, ovoid, glabrous, 0.8 cm across, reddish-brown; basal bracts distinct, persistent.

Sri Lanka to Indochina. Collected once near Uchangi (upper Bisle Ghat) on December 10, 1970. *HFP* 1229.

Ficus tinctoria Forst. f., Prodr. 76. 1786.

subsp. **parasitica** (Willd.) Corner, Gard. Bull. Straits Settlem. 17: 476. 1960; 21: 75. 1965. *Ficus parasitica* Koenig ex Willd., Mem. Acad. Roy. Sci. Hist. (Berlin) 102. 1798. *Ficus tuberculata* Roxb., Fl. Ind. 3: 554. 1832; Wight, Ic. t. 651. 1843. *Ficus gibbosa* Bl. var. *tuberculata* (Roxb.) King, Ann. Roy. Bot. Gard. (Calcutta) 1: 6, t. 2bB. 1887-88; Gamble, Fl. Madras 1365(955). 1928.

Small trees with aerial roots. Leaves subsessile, elliptic-oblong, acute or acuminate at apex, subacute at base, inequilateral, often gibbous on one side, to 6×3 cm, glabrous, scabrid, coriaceous, triplinerved; lateral nerves of 5-6 pairs. Figs in axillary pairs, peduncled, orange-colored, scabrid, sparsely pubescent, 1-1.5 cm across; peduncle 0.4 cm long; basal bracts small.

India, Sri Lanka, Indochina. Rare across plains. March-May. *CJS* 16916, *HFP* 2794.

Ficus tsjahela N. Burman, Fl. Ind. 227. 1768; King, Ann. Roy. Bot. Gard. (Calcutta) 1: 57, t. 70 & 84X. 1887-88 (*'tjakela'*); Gamble, Fl. Madras 1362(953). 1928; Corner, Gard. Bull Straits Settlem. 21: 7. 1965.

Large trees. Petiole 3-5 cm long, articulate to the lamina (seen in young leaves); leaf blade ovate-lanceolate, abruptly acuminate, rounded-truncate at base, to 14×7 cm, glabrous, shining, coriaceous, with 3-5 basal nerves; primary lateral nerves 8-12 pairs. Figs 2-6-fascicled on tubercles in the axils of leaves or fallen leaves, sessile, globular, 0.5 cm across, glabrous, pale yellow when ripe; basal bracts bifid, distinct, patent.

South India, Sri Lanka. Scattered on upper Bisle Ghat. February-May. *CJS* 11257, *HFP* 2737.

Ficus virens Aiton, Hort. Kew. 3: 451. 1789; Corner, Gard. Bull. Straits Settlem. 21: 9. 1965. *Ficus infectoria* Roxb., Fl. Ind. 3: 551. 1832, non Willd., 1806; Wight, Ic. t. 665. 1843; King, Ann. Roy. Bot. Gard. (Calcutta) 1: 60, t. 75 & 84Y2. 1887-88; Gamble, Fl. Madras 1362(953). 1928.

Deciduous, medium trees. Petiole 4-6 cm long; leaf blade ovate-lanceolate, abruptly obtusely acuminate, rounded or truncate at base, to 12×6 cm, slightly glossy, with 3-5 basal nerves & 6-8 pairs of lateral primary nerves. Figs in axillary pairs, shortly peduncled, globular, glabrous, 0.6-1 cm across, creamy white; peduncle to 0.3 cm long; basal

bracts distinct.

Indomalaysia. Scattered on plains and upper Ghats. December-June. *CJS* 16267, *HFP* 12446.

PLECOSPERMUM Trecul

Trees or shrubs, sometimes scandent and armed. Leaves alternate, with minute stipules, petioled, simple, entire, penninerved. Inflorescence axillary, pedunculate, (fleshy) heads. Flowers dioecious. Staminate flower bracteolate, with 4 free, perianth segments and as many stamens, accompanied by a rudimentary pistillode. Pistillate flowers all connate with the fleshy receptacle; perianth tubular, 4-toothed; stigma penicillate, simple. Fruit a few achenes combined into a fleshy receptacle, adnate to perianth.

Plecospermum spinosum (Willd.) Trecul, Ann. Sci. Nat. Bot. ser. 3, 8: 124. 1847; Gamble, Fl. Madras 1353(947). 1928. *Trophis spinosa* Roxb. ex Willd., Sp. Pl. 4: 734. 1806.

A large, scandent shrub, with strong, long spines. Leaves to 6×2.5 cm, elliptic, abruptly tapering into the petiole. Flower white.

India, Sri Lanka. Common in open scrub (Belvathally), in deciduous forests (Byrapura, Bagi), usually in thickets. January-May. *CJS* 16482, *HFP* 1401.

STREBLUS Loureiro *emend.* Corner

Shrubs or trees, armed or not, usually lactiferous. Leaves alternate, stipulate, shortly petioled, simple, entire or minutely denticulate, elliptic, oblong, penninerved. Inflorescence of axillary cymes or racemes, rarely a spike, sometimes capitate; female flowers solitary or 2-4 together. Perianth in male 3-5, shortly connate at base or free, valvate,; in female 4, free, imbricating. Stamens 2-4, free; pistillode rudimentary. Ovary large, tipped by a short style, branching into 2 stigmas. Fruit simple, drupaceous.

Streblus asper Lour., Fl. Cochinch. 2: 615. 1790; Gamble, Fl. Madras 1353(947). 1928; Corner, Gard. Bull. Straits Settlem. 19: 228. 1962.

Lactiferous unarmed trees. Leaves 4.5×2.2 cm, elliptic-oblong, entire, rough. Stamens 4.

China, Indomalaysia. Common on plains, in deciduous forests at Byrapura. March. *CJS* 13091, 16574, 16691.

* * *

Morus alba L. (The Mulberry) and *M. indica* L. (with palmately veined leaves) are extensively cultivated; the former for the fruits and

the latter to feed silk worms; *M. indica* L. is similar to and only distinguishable from *M. alba* L. by the connate stylar bases and obovate female sepals.

18. URTICACEAE

T. P. Ramamoorthy

Shrubs, trees or herbs sometimes climbing, often armed with stinging hairs. Leaves opposite or alternate, rarely estipulate, simple, entire, crenate or serrate, usually triplinerved; the epidermal cells often with punctate or linear cystoliths. Inflorescence variously disposed in cymes, clusters or on a fleshy receptacle (coenanthium), usually dioecious. Tepals in staminate flower 3-5, valvate or imbricating, in pistillate flower usually tubular, 3-5-fid, rarely none. Stamens as many as tepals; filaments inflexed in bud; anther cells dehiscing longitudinally. Ovary superior or semi-inferior, 1-locular with one basal ovule, tipped by 1-3 penicillate or filiform styles. Fruit an achene or a drupe.

1 Plants with stinging hairs.
2 Stipules large, foliaceous; cystoliths punctiform.....**Girardinia**
2 Stipules small, scarious; cystoliths linear.....**Laportea**
1 Plants without stinging hairs.
3 Arborescent shrubs or small trees.
4 Leaves white pubescent beneath; flowers in peduncled branching cymes.....**Debregeasia**
4 Leaves not white pubescent beneath; flowers in sessile, globose clusters.....**Boehmeria**
3 Herbs or undershrubs.
5 Flowers in pedicelled, fleshy coenanthia.....**Lecanthus**
5 Flowers in interrupted spikes or in cymes.
6 Leaves sessile.....**Elatostema**
6 Leaves distinctly petioled.
7 One leaf often reduced to nanophyll or 0.....**Pellionia**
7 Leaves not reduced to nanophylls.
8 Flowers in interrupted long spikes.....**Boehmeria**
8 Flowers crowded, axillary, sessile.....**Pouzolzia**

BOEHMERIA Jacquemont

Large fruticose herbs, shrubs or small trees, without stinging hairs. Leaves alternate or opposite, with lateral, free, caducous stipules, simple, crenate-serrate; cystoliths punctiform. Inflorescence of bracteate flowers in sessile, axillary clusters, sometimes collected into simple or compound spikes, rarely in panicles. Flowers polygamo-dioecious. Perianth 3-5-parted in male with lobes corniculate below tip, in female tubular,

Fig. 16. URTICACEAE. *A. Boehmeria glomerulifera*: pistillate flowering branch; *Aa*, female flower with tubular perianth; *Ab*, gynoecium; *Ac*, male flower. *B. Pellionia heyneana*: male flowering branch; *Ba*, male flower. *C. Lecanthus peduncularis*: female flower. *D. Pouzolzia wightii*: male flower; *Da*, female flower. *E. Girardinia zeylanica*: fruit.

globose, 2-4-tipped, usually hairy. Stamens as many as perianth lobes; pistillode rudimentary, clavate. Style 1, penicillate. Achene enclosed in persistent thin perianth.

1 Leaves alternate; cystoliths punctiform, distinct.....*B. glomerulifera*
1 Leaves opposite and unequal; cystoliths hardly visible.....*B. platyphylla*

Boehmeria glomerulifera Miq. in Zoll., Syst. Verz. Ind. Archip. 101, 104. 1854; Backer & Bakh. f., Fl. Java 2: 45. 1965. *Boehmeria malabarica* Wedd., Arch. Mus. Hist. Nat. 8: 350. 1855-56; Gamble, Fl. Madras 1387(970). 1928.

Shrubs or small trees. Leaves to 23×13 cm, ovate, acuminate, rounded or subcordate at base, serrate with punctate cystoliths above, softly pubescent below. Clusters of flowers on new or old wood.

Indomalaysia. Common in lower Ghats, in shade of tall trees, toward streams. All seasons. *CJS* 13155, *HFP* 1154, 1533.

Boehmeria platyphylla D. Don, Prodr. Fl. Nepal. 60. 1825; Gamble, Fl. Madras 1387(970). 1928.

Fruticose herbs. Leaves to 16×12 cm, opposite, unequal, crenate-serrate, rounded or cordate at base, bullate above with bulbous-based hairs.

South W. India, Sri Lanka. Fairly common large herbs in shade, in wet deciduous to semi-evergreen forests of upper and lower Shiradi Ghats. October-December. *CJS* 11298, 12044, 15387.

DEBREGEASIA Gaudichaud

Arborescent shrubs or small trees without stinging hairs. Leaves alternate with intrapetiolar, deciduous stipules, pinnately veined above the base, with punctiform cystoliths, white pubescent beneath. Inflorescence of globose, capitate flowers in axillary, forking cymes, bracteate. Flowers polygamous and dioecious, shortly pedicelled. Tepals 4-5, free in male, united in female. Stamens as many as perianth segments; pistillode clavate. Ovary adnate to perianth, tipped by caducous, penicillate style.

Debregeasia longifolia (N. Burman) Wedd. in DC., Prodr. 16(1): 235. 1869; Backer & Bakh. f., Fl. Java 2: 49. 1965. *Urtica longifolia* N. Burman, Fl. Ind. 297. 1768. *Debregeasia velutina* Gaud., Bot. Bonite Voy. t. 90. 1844-46; Gamble, Fl. Madras 1389(971). 1928.

Leaves to 15×4 cm, serrate, white pubescent below, with punctiform cystoliths on the bullate upper surface. The achenes with the fleshy perianth form spurious berries, bright red in colour.

Indomalaysia. Common in both upper and lower Ghats, along roads

and in forest clearings. October-December. *CJS* 11395, 12048, *HFP* 2325.

Note: This taxon is often confused with *Trema orientalis* (Ulmaceae) which has 2 free stipules at each node on young growth.

ELATOSTEMA J. & G. Forster *nom. cons.*

Slender, erect to prostrate herbs, without stinging hairs. Leaves alternate, sometimes with a nanophyll opposing it, stipulate, entire or crenate, palmately veined, generally with punctiform or linear, crowded cystoliths. Inflorescence of axillary clusters of flowers. Flowers polygamo-dioecious. Perianth 4-5-partite in male, 3-4-partite in female. Stamens as many as perianth lobes; pistillode rudimentary. Staminodes present in female. Ovary tipped by a penicillate style.

1 Slender erect herbs, under 15 cm.....*E. cuneatum*
1 Prostrate, creeping, suffruticose herbs.....*E. lineolatum*

Elatostema cuneatum Wight, Ic. t. 2091, f. 3. 1853 ('*Elatostema cuniata*'); Gamble, Fl. Madras 1377(963). 1928; Mitra, Bull. Bot. Surv. India 9: 279. 1968.

Slender annuals to 15 cm. Leaves to 2×0.8 cm, sessile, unequal, crenate towards tip, acute; nanophyll 0. Bracteoles in female flower connate into a disc and pilose at tip.

Indomalaysia. Common in Ghats, at bases of trees or rocks or on soil collected in tree crevices. August-September. *CJS* 15066, *HFP* 523.

Note: Very similar to *E. surculosum* Wight which is defined by small, linear, falcate leaves (nanophylls) opposite normal leaves.

Elatostema lineolatum Wight, Ic. t. 1984. 1853 ('*lineolata*'); Gamble, Fl. Madras 1376(963). 1928.

Fruticose herbs, creeping and prostrate. Leaves distantly crenate, sometimes nearly entire, distinctly inequilateral, cuneate at base, caudate-acuminate at tip. Cystoliths many, linear. Stipules hairy.

India. Common in Ghats along streams and rivulets, creeping over wet rocks or tree bases. April-July. *CJS* 14185, *HFP* 324.

GIRARDINIA Gaudichaud

Suffruticose herbs with stinging hairs. Leaves alternate, with large, foliaceous, connate stipules, short-petioled or long-petioled, lobed, crenate-serrate, with punctate cystoliths. Inflorescence of panicled spikes or heads, armed with numerous stinging hairs. Tepals 4-5, free, valvate in male, united in a 2-3-toothed, ventricose tube in female. Stamens 4; pistillode clavate. Achene oblique, tipped by style.

Girardinia zeylanica Decaisne in Jacq., Bot. Voy. Bon. 152. 1844; Gamble, Fl. Madras 1373(960). 1928. *Urtica heterophylla* Willd., Sp. Pl. 4: 362. 1805; Wight, Ic. t. 687. 1843, non Vahl. 1790.

Leaves to 15×15 cm, lobed.

S. India, Sri Lanka. Occasional in upper Ghats. November-January. *CJS* 15788, *HFP* 1131.

LAPORTEA Gaudichaud *nom. cons.*

Diffuse, perennial herbs with stinging hairs. Leaves, with lanceolate, ciliate, deciduous stipules, sometimes estipulate, petiolate, ovate, acuminate, subcordate at base, crenate-dentate, sparsely hairy, with linear cystoliths. Inflorescence of fascicles of flowers, collected into axillary spikes or panicles. Flowers dioecious. Tepals in male 4-5 free, valvate, in female 4, connate. Stamens as many as tepals; pistillode rudimentary, clavate. Ovary and achene oblique, tipped by style.

Laportea interrupta (L.) Chew, Gard. Bull. Straits Settlem. 21: 200. 1965. *Urtica interrupta* L., Sp. Pl. 985. 1753. *Fleurya interrupta* (L.) Gaud. in Freyc., Voy. Bot. 497, t. 8. 1826; Wight, Ic. t. 1975. 1853; Gamble, Fl. Madras 1372(959). 1928.

Stem flexuous or erect, furrowed. Leaves to 9×7 cm, sparsely clothed with weak stinging hairs. Spike slender, more than a foot long.

Paleotropics. Fairly common in upper Ghats, often occurring as weeds in coffee estates. August-October. *CJS* 10081, 10965.

LECANTHUS Weddell

Slender herbs without stinging hairs. Leaves opposite, with connate scarious stipules, with linear cystoliths. Inflorescence an axillary, pedunculate, dense, bracteate coenanthium. Flowers shortly pedicelled, dioecious. Tepals 4-5, free, shortly hooded in male, in female 3-4, equal or unequal. Stamens as many as perianth segments; pistillode rudimentary. Ovary tipped by penicillate, caducous style.

Lecanthus peduncularis (Royle) Wedd. in DC., Prodr. 16: 164. 1869; Sant., Fl. Khandala ed. 3, 254. 1967. *Procris peduncularis* Wall. ex Royle, Illus. Himal. t. 53, f. 2. 1839. *Lecanthus wightii* Wedd., Ann. Sci. Nat. Bot. ser. 4, 1: 187. 1854; Gamble, Fl. Madras 1374 (961). 1928. *Elatostema ovatum* Wight, Ic. t. 1985. 1853 ('*ovata*').

Slender annuals. Leaves with unequal petioles, more or less pubescent below on nerves, sparsely hairy above.

Paleotropics. Common in the Ghats. On wet rocks or on humus

collected in tree crevices. July-October. *CJS* 15067, *HFP* 855.

PELLIONIA Gaudichaud *nom. cons.*

Perennial, spreading, fruticose herbs without stinging hairs. Leaves alternate, with the opposing leaf reduced to 0 or a nanophyll, with large axillary connate stipules. Cystoliths linear. Inflorescence axillary, pedunculate, spreading (male) or contracted (female) cymes, rarely capituliform, dioecious or monoecious. Tepals 5, free, imbricate in male; in female deeply 5-partite, with dorsal, subapical horn. Stamens 5; pistillode rudimentary. Ovary globose.

Pellionia heyneana Wedd., Monogr. 287, t. 5. 1856; Gamble, Fl. Madras 1380(965). 1928.

Spreading herbs with falcately elliptic-lanceolate, entire leaves, unequally subcordate at base. Cystoliths numerous.

South W. India, Sri Lanka. Common. In shade, along riverbanks on crevices of wet dripping rocks in Ghats. May-July. *CJS* 13643, *HFP* 216.

POUZOLZIA Gaudichaud

Herbs or shrubs without stinging hairs. Leaves opposite, alternate or ternate, with lateral, often persistent stipules, sessile or petiolate, simple, entire or crenate, serrate; cystoliths punctate. Inflorescence usually dioecious, of axillary, sessile clusters of flowers. Tepals 4-5, free, valvate, in female united, 2-4-toothed. Stamens 4-5, free; pistillode rudimentary. Style filiform, deciduous. Achene enclosed within the accrescent perianth.

1 Leaves opposite, gradually reduced into floral bracts upwards.....*P. wightii*
1 Leaves alternate, not reduced into floral bracts.....*P. zeylanica*

Pouzolzia wightii Benn., Pl. Jav. Rar. 66. 1838.

1 Plant tomentose all over.....var. *nilghirensis*
1 Plant scabrid all over.....var. *scabra*

var. **nilghirensis** (Wight) J. Hooker, Fl. Brit. India. 5: 584. 1888; Gamble, Fl. Madras 1383(967). 1928. *Pouzolzia nilghirensis* Wight, Ic. t. 2097, f. 26. 1853 ('*neilgherrensis*').

Plant tomentose. Leaves opposite, shortly petioled, to 8×3 cm, ovate, acute or acuminate, entire. Perianth plicate above middle, with inflexed tip, 4, hairy in male, in female tubular, 2-4-fid, winged. Stamens as many as perianth segments.

South W. India. Common. In well-drained places in Ghats. September-November. *CJS* 15611, *HFP* 710.

var. **scabra** (Wight) C. Fischer in Gamble, Fl. Madras 1384(968). 1928. *Pouzolzia scabra* Wight, Ic. t. 2097, f. 29. 1853.

Like preceding variety, but scabrid.

South W. India, Burma. Fairly common in western plains and Ghats. September-January. *CJS* 12506, *HFP* 2169.

Note: Our specimens are often intermediate. Revisionary work is needed.

Pouzolzia zeylanica (L.) Benn., Pl. Jav. Rar. 67. 1838; Sant., Fl. Khandala ed. 3, 255. 1967. *Parietaria zeylanica* L., Sp. Pl. 1052. 1753. *Parietaria indica* L., Mant. 128. 1767. *Pouzolzia indica* (L.) Gaud. in Freyc., Voy. Bot. 503. 1826; Gamble, Fl. Madras 1382 (967). 1928.

Erect or trailing herbs. Leaves alternate, shortly petioled, to 4×1 cm, ovate, acute, glabrate. Perianth 4, concave, hairy in male, tubular, 2-4-toothed, winged or not in female. Stamens 4.

China through Indomalaysia. Occasional in lower Ghats. October. *CJS* 11180.

19. NYCTAGINACEAE

K. N. Gandhi

BOERHAVIA Linnaeus

Erect or creeping, annual herbs, with club-shaped glands or hairs. Leaves opposite, subequal in each pair; stipules 0; blade simple, penninerved. Inflorescence axillary, subcapitate or umbellate cyme, simple or branched; bracts and bracteoles small, caducous. Flowers bisexual, regular. Perianth tubular to campanulate, petaloid, articulate with the pedicel, constricted towards base; tube 5 or 10-ribbed, persistent; limb plicately 5-lobed, deciduous. Stamens 1-4, exserted; filaments unequal and connate at base. Ovary superior (appearing inferior in fruit), stipitate or sessile, 1-locular, with a basal ovule; style erect; stigma peltate. The accrescent perianth tube enclosing the fruit together known as the anthocarp; anthocarp glabrous or viscid to glandular, indehiscent.

1 Flowers distinctly pedicelled; perianth 1 cm long; anthocarp 10-ribbed..... ..... *B. chinensis*

1 Flowers subsessile; perianth less than 0.6 cm long; anthocarp 5-ribbed..... *B. diffusa*

Boerhavia chinensis (L.) Aschers. & Schweinf., Beitr. Fl. Aeth. 1: 167. 1867; Stemmerik in Steenis, Fl. Malesiana ser. 1, 6(3): 455. 1964.

Valeriana chinensis L., Sp. Pl. 33. 1753. *Boerhavia repanda* Willd., Sp. Pl. 1: 22. 1797; Wight, Ic. t. 1766. 1851; Gamble, Fl. Madras 1164(814). 1925.

Diffuse or climbing, slender, glabrescent herbs. Petiole 0.5-2 cm long; leaf blade ovate, acuminate, truncate-cordate at base, to 4 × 4 cm, coriaceous; margin sinuate or not. Umbels simple or branched. Flowers 3-8 together; pedicels 1-1.5 cm long. Perianth 1 cm long, constricted below the middle. Stamens 3-4. Anthocarp clavate, glandular along the 10 ribs.

Paleotropics. Occasional weed in dry deciduous plains. October-December. *CJS* 11985, 15174.

Boerhavia diffusa L., Sp. Pl. 3. 1753; Gamble, Fl. Madras 1163(814). 1925; Stemmerik in Steenis, Fl. Malesiana ser. 1, 6(3): 454. 1964. *Boerhavia procumbens* Banks ex Roxb., Fl. Ind. 1: 148. 1820, *nom. superfl.*; Wight, Ic. t. 874. 1844-45.

Diffuse and ascending, slender, sparsely pubescent herbs. Petiole 0.3-1 cm long; leaf blade slightly undulate along the margin, ovate-oblong-lanceolate, acute or obtuse at apex, rounded-cordate at base, 1.5-2×1 cm, coriaceous. Inflorescence a panicle of subcapitate umbels. Flowers 4-8 together. Perianth 2-3 mm long, white, red or pink, constricted at the middle. Stamens 1-3. Fruits clavate, glandular along the 5 ribs.

Pantropics. Common weed in open dry places especially on the plain. May-July. *CJS* 13757.

* * *

Bougainvillea spectabilis Willd. from Brazil is often cultivated for its showy 'flowers' (colored bracts adnate to pedicels of true flowers). *Mirabilis jalapa* L. from Mexico is also cultivated for its brilliant, elongate flowers.

20. CACTACEAE

T. P. Ramamoorthy

Perennial, armed, succulents, mostly of shrubby habit. Stem jointed or not, flattened, fluted or terete, armed with spiny areoles which are also often woody. Leaves usually reduced or absent, alternate. Perianth of many lobes, outer smaller and calycine, the inner petaloid. Stamens many, free, arising from base or sides of perianth tube, filaments elongate; anther cells 2, dehiscing longitudinally. Ovary inferior, 1-locular with many ovules on 3-more parietal placentas; style simple; stigmas 2-many. Fruit a berry.

1 Areoles with glochids; stems jointed, the joints more or less flattened but not ribbed; perianth spreading.....**Opuntia**
1 Areoles without glochids; stems not uniformly jointed, the segments radially fluted or ribbed; perianth tubular.....**Eriocereus**

ERIOCEREUS Berger

Erect to arching succulent shrub with branches 3-7-ribbed; areoles 1-10-spined, woolly but not glochidiate. Perianth long-tubular. Flowers solitary on a spiny areole, nocturnal. Ovary with scales subtending felty tufts of hair much shorter than perianth. Stigmas 9-more.

Eriocereus bonplandii (Pfeiffer) Riccobono, Boll. Reale Orto Bot. Girardino Colon. Palermo 8: 238. 1909. *Cereus bonplandii* Parm ex Pfeiffer, Enum. Diagn. Cact. 108. 1837.

Branches strongly 3-angled, greyish-green, to 7.5 cm wide; spines 6-10, grey and brown-tipped. Flowers white, 17-20 cm long.

Southern South America. Planted along hedges in Hassan town. January-May. *CJS* 11672, 16081.

Note: Our determination is tentative, being based on the keys and descriptions in Bailey (*Manual of Cultivated Plants*, 1949).

OPUNTIA Linnaeus

Erect succulent shrubs with subflattened joints; areoles typically with spines, woolly and brittle, retrorsely barbed glochids. Perianth shortly spreading. Flowers solitary on a spiny areole, diurnal. Ovary areolate, longer than perianth. Stigmas 5-7.

1 Spines 3-7 per areole, thick, the larger often flattened and curved, entirely translucent yellow more or less mottled brown, 3-7 per areole.....*O. dillenii*
1 Spines 1 per areole, terete, straight, greyish with a brown translucent tip.....
.....*O. vulgaris*

Opuntia dillenii (Ker-Gawler) Haworth, Suppl. Pl. Succ. 79. 1819; Gamble, Fl. Madras 548(387). 1918. *Cactus dillenii* Ker-Gawler, Edward's Bot. Reg. 3: t. 255. 1818.

Erect, branching shrubs to 4-5 m. Segments flat with many areoles bearing flattened yellowish spines. Flowers 9 cm long, petals to 2 cm long, bright yellow. Berry globose, fleshy, areolar and glochidiate.

Introduced from *Americas*. Common in scrub jungles, roadsides and neglected lands in Belvathally, Arsikere. January-August. *CJS* 16044, *HFP* 1964.

Opuntia vulgaris Miller, Gard. Dict. ed. 8, 1. 1768; Backer & Bakh. f., Fl. Jav. 1: 316. 1963. *Opuntia monacantha* (Willd.) Haw., Syn. Pl.

Succ. 81. 1812; Gamble, Fl. Madras 548(387). 1918. *Cactus monacanthos* Willd., Enum. Pl. Suppl. 33. 1813. *Cactus indicus* Roxb., Fl. Ind. 2: 475. 1832.

Shrub with flat segments covered with scattered 1-spined areoles. Spines terete, greyish, brown-tipped. Flowers yellow.

Introduced from *Americas*. Along hedges in Channarayapatna in the plains. August. *CJS* 10940.

21. AIZOACEAE

T. P. Ramamoorthy

TRIANTHEMA Linnaeus

Annual or perennial herbs. Leaves opposite, stipulate, indistinctly pinnately veined. Inflorescence axillary. Perianth deeply 4-5-lobed. Stamens 5-many, usually alternating with perianth lobes, solitary, paired or fascicled. Ovary superior, 1-2-locular; ovules 1-many, basal; styles 1-2. Fruit capsular.

Trianthema decandra L., Mant. 79. 1767; Wight, Ic. t. 296. 1840; Gamble, Fl. Madras 551(381). 1919.

Prostrate much-branched herbs. Leaves subsucculent, those of the opposite pair slightly unequal, joined below by the papery petiolar sheath. Inflorescence few-flowered. Perianth pink. Stamens 10-15. Ovary 2-locular; ovules 2 in each locule; styles 2. Fruit circumscissile, separating into 2 parts, each with 2 seeds.

Indomalaysia. Fairly common weed in dry areas in the eastern plains at Channarayapatna. August. *CJS* 10818.

22. MOLLUGINACEAE

T. P. Ramamoorthy

Usually prostrate or erect herbs. Leaves opposite or in spurious whorls; stipules minute, fugacious; blade simple, entire, penninerved. Inflorescence in axillary or terminal cymes or racemes, sometimes umbellate, bracteate. Flowers stalked, bisexual, regular; bracteoles 0. Tepals 3-5, free, usually carinate with scarious margins, imbricate, persistent, sepaloid or petaloid. Stamens 3-10, free, often intermixed with staminodes; filaments sometimes shortly connate. Ovary superior, 3-5-locular; styles 3-5; ovules many, axile. Fruit a many-seeded, loculicidal capsule. Seeds smooth or tuberculate, strophiolate (with a scale)

or not; strophiole with or without a long, filiform appendage which resembles a funicle.

1 Seeds with a distinct elongate, curved appendage.....**Glinus**
1 Seeds with or without a very short appendage.....**Mollugo**

GLINUS Linnaeus

Annuals. Inflorescence of axillary clusters. Tepals 5, herbaceous, subcarinate, glabrous or hairy. Stamens 3-10, free, sometimes intermixed with staminodes. Ovary 3-5-locular with as many styles. Seeds usually tuberculate, strophiolate with a filiform appendage.

1 Tepals hairy.....*G. lotoides*
1 Tepals glabrous.....*G. oppositifolius*

Glinus lotoides L., Sp. Pl. 463. 1753. *Mollugo lotoides* (L.) Kuntze, Rev. Gen. Pl. 214. 1891; Gamble, Fl. Madras 552(390). 1919.

Leaves fascicled, obovate, to 1.5×1.2 cm, apiculate, shortly petioled, hairy. Tepals white, ovate, acute, hairy. Stamens 10, intermixed with linear, membranous staminodes. Ovary 5-locular; styles 5.

Tropics. Occasional in dry river beds, in lower Ghats. April. *CJS* 9697.

Glinus oppositifolius (L.) A. DC., Bull. Herb. Boissier ser. 2, 1: 559. 1901. *Mollugo oppositifolia* L., Sp. Pl. 89. 1753; Gamble, Fl. Madras 552(390). 1919.

Slender decumbent herbs. Leaves fascicled at nodes, to 2.5×1.5 cm, shortly petioled, obovate. Tepals white, 5, elliptic, glabrous. Stamens 5. Ovary 3-locular; styles 3.

Paleotropics. Common in Ghats; often on dry sandy river beds. September-May. *CJS* 11733, 13423.

MOLLUGO Linnaeus

Erect, slender herbs. Leaves opposite, whorled. Inflorescence axillary or terminal cymes or in false racemes, bracteate. Tepals 5, free. Stamens 3-5; staminodes 0. Ovary 3-locular; styles 3. Seeds with an indistinct or without an appendage, smooth or tuberculate.

1 Flowers in axillary clusters; seeds smooth.....*M. cerviana*
1 Flowers in racemes; seeds tuberculate.....*M. pentaphylla*

Mollugo cerviana (L.) Seringe in DC., Prodr. 1: 392. 1824; Gamble, Fl. Madras 553(390). 1919. *Pharnaceum cerviana* L., Sp. Pl. 272. 1753.

Fig. 17. MOLLUGINACEAE. *A. Mollugo cerviana*: habit; *Aa*, flower; *Ab*, seed. *B. Glinus oppositifolius*: habit; *Ba*, flower; *Bb*, seed; *Bc*, fruit with remnants of flower. *C. Mollugo pentaphylla*: habit; *Ca*, flower; *Cb*, seed.

Annuals, branching from base. Leaves fascicled, linear, glaucous green. Tepals obovate, green. Stamens 5. Seeds smooth, estrophiolate.

Paleotropics. Locally common, near Belvathally, in dry Ragi fields. August. *HFP* 1959.

Mollugo pentaphylla L., Sp. Pl. 89. 1753; Gamble, Fl. Madras 553(890). 1919.

Ascending herbs. Leaves fascicled, obovate, mucronate, narrowed at base. Tepals white. Stamens 3. Seeds tuberculate, strophiolate.

Paleotropics. Common in open places on plains and Ghats. July-October. *CJS* 15215, *HFP* 2055.

23. CARYOPHYLLACEAE

T. P. Ramamoorthy

Annual or perennial herbs, sometimes suffrutescent. Leaves usually opposite or whorled; stipules scarious, entire or lacerate, sometimes 0; blade simple, entire, usually narrow. Inflorescence usually a terminal cyme, sometimes racemiform, bracteate. Flowers bisexual, occasionally unisexual, regular; bracteoles 0. Sepals 3-6, free or united below, imbricate, persisting. Petals as many as sepals or calyx lobes, free, usually incised, sometimes absent, usually with coronal scales. Stamens usually as many as the number of petals, rarely fewer; filaments free or shortly connate; anther 2-celled, dehiscence longitudinal; disc usually annular and small, sometimes segmented. Ovary superior, 1-locular or incompletely 2-5-locular; ovules many on a free central placenta; styles 2-5, free or jointed. Fruit generally a capsule, rarely a berry or achene; dehiscence irregular or more commonly by teeth or valves equaling or double the number of styles. Seeds usually many.

1 Leaves suborbicular, 3-5-nerved.....**Drymaria**
1 Leaves linear, 1-nerved.
2 Sepals thin, scarious throughout; style 3-fid.....**Polycarpaea**
2 Sepals keeled, scarious only on margin; style 3-toothed.....**Polycarpon**

DRYMARIA Willdenow

Slender annual herbs. Leaves opposite; stipules lacerate, filiform; blade rounded and orbicular. Inflorescence axillary or terminal, of slender dichasial cymes. Flowers bisexual. Sepals 5, more or less keeled, with scarious margins, free; petals 5, 2-6-fid, persistent. Stamens 3-5, free. Ovary stalked, style 3-fid. Capsule 3-valved.

Drymaria cordata (L.) Roemer ex Schultes, Syst. Veg. 5: 406. 1820;

Fig. 18. CARYOPHYLLACEAE. *A. Drymaria cordata*: habit; *Aa*, flower. *B. Polycarpon prostratum*: habit; *Ba*, flower. *C. Polycarpaea corymbosa*: flower; *Ca*, opened flower, from above; *Cb*, capsule with one valve removed.

Gamble, Fl. Madras 63(46). 1915. *Holosteum cordatum* L., Sp. Pl. 88. 1753.

ssp. **diandra** (Blume) Duke, Ann. Missouri Bot. Gard. 48: 253. 1961; Majumdar, Bull. Bot. Surv. India 10: 294. 1969. *Drymaria diandra* Blume, Bijd. 62. 1825; Mizushima, J. Jap. Bot. 32: 69-81. 1957.

Diffuse, glabrous, ascending herbs. Leaves to 2×1.8 cm, suborbicular, 3-5-nerved, glabrous; stipules lacerate with filiform segments. Petals 2-fid, white. Stamens 3.

Paleotropics. Occasional, in moist shaded areas in upper Ghats (Hanbal). October. *CJS* 10100, 10101, 10102.

POLYCARPAEA Lamarck *nom. cons.*

Erect annuals or subperennial, branching herbs. Leaves opposite or fascicled in whorls at nodes; stipules scarious. Inflorescence terminal or axillary, of scarious, bracteate cymes. Flower bisexual. Sepals 5, imbricating, free, scarious; petals 5. Stamens 5, free or basally cohering with petals. Style 3-fid. Capsule 3-valved, many-seeded.

Polycarpaea corymbosa (L.) Lam., Tab. Encycl. 2: 129. 1797; Wight, Ic. t. 712. 1843; Gamble, Fl. Madras 65(46). 1915. *Achyranthes corymbosa* L., Sp. Pl. 205. 1753.

A tomentose, branching annual or perennial. Leaves fascicled at nodes, to 1.1×0.1 cm, linear, with a small mucro at tip; stipules fimbriate. Cymes terminal and axillary. Calyx scarious, silvery. Petals entire or erose, completely enclosed in calyx.

Asia. Common, in open, sandy or rocky ground. August-December. *CJS* 11906, *HFP* 2425.

POLYCARPON Linnaeus

Erect or decumbent herbs. Leaves opposite, sometimes apparently whorled. Inflorescence terminal or axillary, dichasial cymes; bracts scarious. Flower bisexual. Sepals 5, herbaceous, keeled, scarious along margin; petals 5. Stamens 3-5. Style 3-toothed. Capsule 3-valved.

Polycarpon prostratum (Forskal) Aschers. & Schweinf., Osterr. Bot. Zeitschr. 39: 128. 1889; Sant., Fl. Khandala ed. 3, 12. 1967. *Pharnaceum depressum* L., Mant. Alt. 562. 1771 (non *Polycarpon depressum* Nutt. ex Torrey & Gray, 1838). *Alsine prostrata* Forsk., Fl. Aegyp.-Arab. 207. 1775. *Hapalosa loeflingiae* Wall. ex Wight & Arn., Prodr. 358. 1834. *Polycarpon loeflingiae* (Wight & Arn.) Bentham & J. Hooker ex Edgeworth & J. Hooker in J. Hooker, Fl. Brit. India 1:245. 1874;

Gamble, Fl. Madras 64(46). 1915.

Decumbent herbs. Stem subpubescent. Leaves opposite; lower leaves crowded to simulate whorls of 4, obovate; stipules scarious; blade 1.5×0.5 cm, spatulate. Stamens 5. Seeds reticulate.

Asia. Common in seasonal marshes, rice fields, dry sandy river beds, in open country. All seasons. *CJS* 13528, 15181.

Note: *Polycarpon tetraphyllum* has seeds which are minutely tuberculed or papillose, whereas *P. prostratum* has seeds that are not tubercled or papillose, but reticulate.

24. PORTULACACEAE

T. P. Ramamoorthy

PORTULACA Linnaeus

Usually succulent perennial herbs with roots generally swollen and tuber-like. Leaves usually alternate; those above forming an involucre below flowers; stipules scaly or hairy; blade flat or terete, entire. Flowers solitary or clustered, terminal, subsessile; bracts and bracteoles 0. Sepals 2, free. Petals 2-6 or more, usually free, imbricate, brightly colored, fugacious. Stamens 4-many, free, pubescent. Ovary half-inferior, 1-locular; ovules many, on free central placenta. Style branching into 2-8 stigmas. Capsule circumscissile below middle; operculate portion thin walled. Seeds many, reniform, compressed, tuberculate.

1 Leaves flat, obovate to spatulate; sepals distinctly carinate.....*P. oleracea*
1 Leaves terete, linear to elliptic; sepals not carinate.....*P. pilosa*

Portulaca oleracea L., Sp. Pl. 445. 1753; Gamble, Fl. Madras 66(47). 1915; Geesink, Blumea 17: 292. 1969.

Prostrate, succulent herbs; stem tinged with pink; nodes without scales. Leaves very shortly petioled, to 1.5×0.5 cm, obovate, notched at tip. Flowers clustered. Sepals enveloping fruit. Petals 5-6, yellow. Stamens 8-12. Style 3-5-branched.

Tropics. Common edible and cultivated; often found as a weed. May-September. *CJS* 13741.

Portulaca pilosa L., Sp. Pl. 445. 1753; Geesink, Blumea 17: 294. 1969.

Portulaca tuberosa Roxb., [Hort. Beng. 91. 1814, *nom.*] Fl. Ind. 2: 464. 1832; Gamble, Fl. Madras 66(47). 1915.

Herbs with fleshy, fusiform root. Leaves alternate, linear, terete; stipules hairy. Flower usually solitary. Petals 5-6, pink or white. Stamens 10-12 or more; styles 3-branched or more. Seeds red-brown; cells of the testa elliptic.

India, Sri Lanka. Common in plains, usually in sandy or rocky areas.

June-August. *CJS* 14266, *HFP* 16.

Note: Our material (*CJS* 14266) seems to belong to *P. pilosa* ssp. *pilosa* of the race '*australis*'.

25. CHENOPODIACEAE

T. P. Ramamoorthy

CHENOPODIUM Linnaeus

Herbaceous, rarely arborescent, usually covered by vesicles when young. Leaves usually alternate, estipulate, entire to deeply incised. Inflorescence axillary or terminal, of interrupted spikes or panicles, usually bracteate and ebracteolate. Flowers usually sessile, clustered in small cymes (glomerules), bisexual or sometimes female, regular. Perianth herbaceous, 2-5-lobed, valvate. Stamens as many as tepals, sometimes fewer. Ovary superior, 1-locular, with a solitary basal or lateral ovule; styles 1-3, sometimes very short; stigmas 2-5. Fruit an achene, falling with the persistent, sometimes accrescent perianth.

Chenopodium ambrosioides L., Sp. Pl. 219. 1753; Wight, Ic. t. 1786. 1852; Gamble, Fl. Madras 1181 (827). 1925.

An aromatic profusely branching, annual herb. Leaves to 5.5×0.5 cm, sinuate-dentate, the upper ones bract-like. Perianth green. Ovary with yellow glands above. Stigmas 5. Utricle enclosed in the persistent perianth.

Native of Tropical America. Introduced and naturalized in the tropics. Occasional in plains. September-July. *CJS* 8987, 10646.

Note: Chenopodium album L., which can be expected, is non-aromatic and distinguished from *C. ambrosioides* by its 2 stigmas.

* * *

Beta vulgaris L. (Beet) is cultivated for its edible fleshy root, which is used as a vegetable.

26. AMARANTHACEAE

T. P. Ramamoorthy

The editors are grateful to Mr. C. C. Townsend (Kew) for going through the manuscript.

Erect or rambling herbs or shrubs. Leaves alternate or opposite, estipulate, petioled or not, simple, entire or obscurely dentate-serrate; penninerved. Inflorescence of spikes, racemes, heads or clustered flowers.

Flowers solitary in the axil of persistent bracts, 2-bracteolate, bisexual, sometimes unisexual, sessile. Perianth calycine, 3-5-segmented, free or obscurely connate at base, scarious-margined or scarious, deciduous. Stamens as many as and opposite perianth lobes, sometimes fewer, alternating with shorter pseudostaminodes; filaments usually connate below into a cup, sometimes completely fused to form a tube; anthers dorsifixed, 1-2-celled. Ovary superior, 1-locular, 1-many-ovuled; style none or simple, forking into 2-4 stigmas. Fruit 1-many-seeded utricle dehiscing circumscissilely or irregularly, sometimes indehiscent.

1 Leaves opposite.
2 Spike long, narrow, lowest flowers finally remote; flowers deflexed after anthesis.
3 Modified flowers with hooked spines present.....**Cyathula**
3 Modified flowers with hooked spines absent.....**Achyranthes**
2 Flowers in a dense globose or cylindrical head.
4 Staminal filaments fused below middle.....**Alternanthera**
4 Staminal filaments completely fused forming a tube.....**Gomphrena**
1 Leaves alternate, sometimes in alternate fascicles.
5 Flower unisexual.....**Amaranthus**
5 Flower bisexual.
6 Spikes elongate, often forming a thyrsoid panicle.....**Indobanalia**
6 Spikes short, not panicled.
7 Utricle many-seeded.....**Celosia**
7 Utricle single-seeded.
8 Flowers in round or shortly ovoid heads; plant not white pubescent....**Allmania**
8 Flowers in spikes; plant white pubescent.....**Aerva**

ACHYRANTHES Linnaeus

Woody terrestrial herbs, erect or ascending. Leaves opposite, sessile, entire, linear-lanceolate to orbicular-obovate. Inflorescence a terminal and/or axillary, many-flowered, eventually elongate spike; rachis pilose-hairy. Flower bisexual, deflexed after anthesis; the subtending bract and bracteoles spinescent, winged at base. Perianth segments 5, free, herbaceous to coriaceous, 1-more-nerved. Stamens 5, alternating with pseudostaminodes; filaments united at base into a cup. Ovary 1-ovuled; style short; stigma capitate. Fruit an indehiscent utricle, shed with persistent, pungent perianth.

1 Basal wing of the spinescent bracteole adnate throughout the length of spine; staminodes truncate, fimbriate.....*A. aspera*
1 Basal wing of the spinescent bracteole adnate to the base of the spine, otherwise free; staminodes truncate, toothed, not fimbriate.....*A. bidentata*

Achyranthes aspera L., Sp. Pl. 204. 1753; Wight, Ic. t. 1777. 1852; Gamble, Fl. Madras 1176(823). 1925.

A stiff herb, branching from base. Leaves very variable, usually orbicular-obovate, hairy or glabrous. Spike usually more than a foot long

Fig. 19. AMARANTHACEAE. *A. Alternanthera pungens*: habit. *B. Allmania nodiflora*: flowering branch. *C. Gomphrena celosioides*: flower with tepals removed and staminal tube split open to show the ovary. *D. Alternanthera sessilis*: flower with 5 tepals and 3 bracts; *Da*, flower with tepals removed. *E. Achyranthes aspera*: flower with tepals removed and staminal tube split open to show the ovary. *F. Indobanalia thyrsiflora*: flower with tepals removed. *G. Amaranthus spinosus*: pistillate flower. *H. Celosia argentea*: vertical section of ovary.

when mature. Flowers often pink.

Pantropical. Common, a troublesome weed of roadsides and waste places; the fruits catching on skin and clothes. September-April. *CJS* 15368, *HFP* 2058.

Achyranthes bidentata Blume, Bijd. 545. 1826; Wight, Ic. t. 1779. 1852; Gamble, Fl. Madras 1176 (824). 1925.

A branching, woody herb. Leaves highly variable, usually lanceolate, acute at both ends, glabrous. Flowers green.

Indomalaysia, Africa. Occasional in upper Ghats, in shade in wet situations. October. *HFP* 882.

AERVA Forskal *nom. cons.*

Erect or scrambling herbs or undershrubs. Leaves alternate or opposite, sometimes fascicled, flat or linear and setaceous, entire. Inflorescence usually of panicled spikes, dense. Flowers bisexual or polygamo-dioecious. Perianth of 4-5 free, thin and membranous or firm, pilose tepals. Stamens 4-5, alternating with pseudostaminodes; filaments connate below into a cup; anther 2-celled. Ovary compressed or globose, glabrous, with a long funicle and solitary, pendant ovule; style short; stigmas 1-2. Utricle bursting irregularly, compressed, 1-seeded.

1 Leaves linear and setaceous; tepals and stamens 4 each.....*A. monsoniae*

1 Leaves flat or obovate; tepals and stamens 5 each.....*A. lanata*

Aerva lanata (L.) Juss., Ann. Mus. Nat. Hist. Paris 11: 131. 1808; Gamble, Fl. Madras 1170(825). 1925. *Achyranthes lanata* L., Sp. Pl. 205. 1753.

Tomentose, prostrate herbs, branching from rootstock. Leaves alternate, entire, obovate. Spikes axillary, usually 2-4 together. Flowers white, 5-merous.

Tropical Africa to Indomalaysia through Arabia. Common in plains, in dry wastelands. October-April. *CJS* 11942, 15363.

Aerva monsoniae (L. f.) Mart., Nov. Actorum Acad. Caes. Leop.-Carol. Nat. Cur. 13: 291. 1826; Wight, Ic. t. 725. 1843; Gamble, Fl. Madras 1178(825). 1925. *Illecebrum monsoniae* L. f., Suppl. 161. 1781.

Hardy tomentose herb; branches radiating from a common rootstock. Leaves linear, setaceous, fascicled at nodes. Spikes solitary or 1-4 together. Flowers pink, 4-merous.

India, Burma, Sri lanka. Common on the Plains in dry places along roadsides and waste-places. November-January. *CJS* 16058, *HFP* 1117.

ALLMANIA R. Brown ex Wight

Erect or ascending herbs. Leaves alternate, usually sessile, entire.

Inflorescence of terminal or leaf-opposed, sessile or stalked heads, composed of few-flowered cymes. Flowers bisexual. Perianth of 5, usually free, subequal tepals. Stamens 5; filaments fused at base into a short cup; anthers 2-celled; staminodes 0. Ovary compressed with solitary, erect ovule; style short; stigma capitate, sometimes bifid. Utricle circumscissile below middle.

Allmania nodiflora (L.) R. Br. [in Wall., List 6890. 1832, *nom.*] ex Wight, J. Bot. (Hooker) 1: 226. 1834; Gamble, Fl. Madras 1167 (817). 1925. *Celosia nodiflora* L., Sp. Pl. 205. 1753.

1 Leaves 6×2 cm, broadly elliptic, base narrowed and petiole-like, drying olive green .....var. *dichotoma*
1 Leaves 4×1 cm, elliptic-lanceolate, base not narrowed, drying brown.....
.....var. *procumbens*

var. **dichotoma** (Roth) J. Hooker, Fl. Brit. India 4: 717. 1885. *Celosia dichotoma* Heyne ex Roth, Nov. Pl. Sp. 172. 1821. *Allmania dichotoma* (Roth) Wight, Ic. t. 1771. 1852.

Occasional, in wastelands and roadsides, immediately recognized by the red tepals. October-November. *CJS* 15551, *HFP* 1071.

var. **procumbens** J. Hooker, Fl. Brit. India 4: 717. 1885. *Chamissoa nodiflora* sensu Wight, Ic. t. 1770. 1852, non (L.) Mart. ex Moq., 1849.

Indomalaysia. Common in eastern plains, in wastelands, usually in shade of shrubs. October-November. *CJS* 14255, 14282.

ALTERNANTHERA Forskal

Erect or prostrate, ascending or scrambling herbs, sometimes aquatic and floating. Leaves opposite, sessile or shortly petioled, entire. Inflorescence axillary or terminal, sessile or peduncled heads, sometimes spikes. Flowers bisexual. Perianth of 5, free, equal or unequal, usually dorsally compressed, glabrous or hairy tepals. Stamens 2-5; filaments basally uniting into a short cup, free part alternating with usually forked pseudostaminodes; anther 1-celled. Ovary compressed or not, with a solitary, pendulous ovule, with a long funicle; style short; stigma capitate. Utricle indehiscent, falling with perianth.

1 Head prickly; tepals very dissimilar; glochidiate hairs present.....*A. pungens*
1 Head not prickly; tepals all similar; glochidiate hairs absent.
2 Stem with long crisped hairs on the younger parts; outer tepals 3 mm, 3-nerved from base.....*A. paronychioides*
2 Stem without long crisped hairs; outer tepals 2 mm, 1-nerved from base.....
.....*A. sessilis*

Alternanthera paronychioides St. Hil., Voy. Bres. 2: 439. 1833.

Prostrate, creeping, branching herbs. Leaves 1-1.5 × 0.5 cm, oblan-

ceolate-elliptic, hairy. Flower heads numerous, sometimes to 1.5 cm long, 0.5 cm broad; tepals pilose on back. Stamens 3-5, alternating with sublacerate staminodes.

Tropical America. There is no record of its occurrence in major Indian floras. It is common on bunds of paddy fields and dry unploughed fields and along roads. January. *HFP* 1393.

Alternanthera pungens Humb., Bonpl. & Kunth, Nov. Gen. Sp. Pl. 2: 206. 1818; Melville, Kew Bull. 12: 178. 1958. *Achyranthes repens* L., Sp. Pl. 205. 1753. *Alternanthera repens* (L.) Link, Enum. Pl. Hort. Bot. Berol. 1: 154. 1821, non Gmelin, 1791.

Prostrate, branching herbs. Leaves to 3.5×2.8 cm, oblanceolate, elliptic or more or less rounded. Outer 2 tepals similar to spinescent bracts; 2 innermost deeply keeled-concave, hairy on the back.

Tropics. Common weed of roadsides, wastelands and arid open spaces. August-December. *CJS* 11323, 11949.

Alternanthera sessilis (L.) R. Br. ex DC., Cat. Pl. Hort. Bot. Monspel. 4: 77. 1813; Wight, Ic. t. 727. 1843. *Gomphrena sessilis* L., Sp. Pl. 225. 1753. *Alternanthera triandra* Lam., Encycl. 1: 95. 1783; Gamble, Fl. Madras 1179(825). 1925.

Prostrate, branching herbs. Leaves to 2.5×0.4 cm, elliptic, rounded at tip, cuneate at base. Flower heads globose, becoming cylindrical later. Tepals more or less equal, glabrous, 1-nerved. Stamens 3-5, alternating with filamentous staminodes.

Paleotropics. Common in wet situations, like edges of tanks, moist-dry tank beds, etc. All seasons. *CJS* 13926, *HFP* 2068.

AMARANTHUS Linnaeus

Erect or decumbent, unarmed or spinous, annual herbs. Leaves alternate, usually petioled, entire. Inflorescence of floral clusters collected into axillary and terminal, solitary or panicled spikes. Flowers unisexual. Perianth 3-5, free, subequal, usually green. Stamens as many as perianth lobes; filaments free; anthers 2-celled; staminodes none. Ovary ovoid, compressed, enclosing a single, erect ovule; style 1; stigmas 2-3. Utricle membranous, circumscissile or not, single-seeded.

Note: Several species of *Amaranthus* are cultivated for leafy vegetables.

1 Leaf axils with spines.....*A. spinosus*
1 Leaf axils without spines.....*A. viridis*

Amaranthus spinosus L., Sp. Pl. 991. 1753; Wight, Ic. t. 513. 1841; Gamble, Fl. Madras 1170(819). 1925.

Profusely branched herbs to 1 m. Leaves 5×2 cm, alternate, elliptic, entire. Tepals and stamens 5-merous. Stigmas 3. Seed dark brown.

Tropics. A common weed in waste-places and roadsides. All seasons. *CJS* 12028, *HFP* 2074.

Amaranthus viridis L., Sp. Pl. ed. 2, 1405. 1763; Gamble, Fl. Madras 1171(820). 1925. *Amaranthus gracilis* Desf., Tabl. Hort. Par. 43. 1804.

Slender unarmed herbs with stem slightly pink. Leaves entire, ovate, emarginate at tip. Tepals and stamens 3-merous. Seeds black.

Tropics. Occasional. March. *CJS* 13072.

CELOSIA Linnaeus

Annual, fruticose, erect, glabrous herbs. Leaves alternate, entire. Inflorescence a dense-flowered, terminal spike. Flowers bisexual. Perianth of 5 free tepals. Stamens 5; filaments fused at base to form a short cup; the free part alternating with small pseudostaminodes. Ovary broad, with many ovules on short funicles; style long; stigma capitate, obscurely 2-3-lobed. Utricle thin, circumscissile below middle; seeds many, black.

Celosia argentea L., Sp. Pl. 205. 1753; Wight, Ic. t. 1767. 1852; Gamble, Fl. Madras 1166(816). 1925.

Stem angular. Leaves to 3.5×0.3 cm, linear, 1-nerved. Spikes showy with pure white or pink flowers.

Tropics. Common in plains, often in dry fields. September-December. *CJS* 15560, *HFP* 2426.

CYATHULA Blume *nom. cons.*

Herbs or undershrubs. Leaves opposite, sessile, entire. Inflorescence a long terminal spike with sessile flowers in stalked clusters. Cluster composed of 1-3 perfect flowers which are deflexed after anthesis and few imperfect flowers reduced to tepals with hooked awns. Perianth of 5, free tepals. Stamens 5; filaments fused at base into a small cup; free portion alternating with pseudostaminodes; anthers 2-celled. Ovary with pendulous ovule; style short; stigma capitate. Utricle thin-walled, indehiscent.

Cyathula prostrata (L.) Blume, Bijd. 549. 1825; Wight, Ic. t. 733. 1843; Gamble, Fl. Madras 1172(820). 1925.

Creeping-ascending herbs. Leaves 3×2.5 cm, rhomboid, ovate, hairy especially towards axil. Inflorescence hairy on rachis. Perianth with scarious margins, 1-nerved, hairy on the outside.

Paleotropics. Common in Ghats, in disturbed areas. October-November. *CJS* 11512, *HFP* 979.

GOMPHRENA Linnaeus

Annual or perennial, erect or diffuse, procumbent herbs. Leaves opposite, usually sessile. Inflorescence terminal, of sessile or shortly stalked heads or short spikes. Flowers bisexual. Tepals 5, free, pilose on the back. Stamens 5; filaments completely united into a tube; anthers sessile, 1-celled, alternating with pseudostaminodes. Ovary globose with a solitary ovule; style elongate; stigmas 2. Utricle indehiscent.

Gomphrena celosioides Mart., Beitr. Amar. 93. 1825. *Gomphrena decumbens* sensu Gamble, Fl. Madras 1179(825). 1925, non Jacq.

Diffuse herbs. Leaves opposite, entire, 3.5×1 cm, obovate or elliptic. Perianth pilose on back, keeled dorsally at apex.

Introduced from *Tropical America*, now common in Tropics. Common on the plains, in dry or wet soil. All seasons. *CJS* 13981, *HFP* 2105.

INDOBANALIA Henry & Roy

Erect, branching glabrous herbs. Leaves alternate, petiolate, minutely serrate, ovate-lanceolate, acuminate, membranous. Inflorescence an axillary spike or a terminal, pedunculate, thyrsoid panicle of spikes. Flowers bisexual, clustered. Perianth of 5, free, lanceolate, acute, equal tepals. Stamens 5; filaments fused at base into a short cup; anthers 2-celled; staminodes none. Ovary ovoid, compressed; style single, elongate, branching into 2 penicillate, curved stigmas. Utricle indehiscent.

Indobanalia thyrsiflora (Moquin) Henry & Roy, Bull. Bot. Surv. India 10: 274. 1968. *Banalia thyrsiflora* Moquin in DC., Prodr. 13(2): 278. 1849; Gamble, Fl. Madras 1167(817). 1925.

Leaves to 13.5×5 cm. Flowers white.

South W. India. Common in Ghats, in disturbed areas and outskirts of forests. January-March. *CJS* 12568, *HFP* 2611.

27. POLYGONACEAE

K. N. Gandhi

POLYGONUM Linnaeus

Herbs or shrubs. Leaves alternate; stipules connate into a tubular, membranous ocrea, sheathing stem; blade simple; venation pinnate. Inflorescence usually a spiciform head or panicled raceme; bracts and bracteoles ocreaceous. Flowers usually bisexual, regular; pedicels articulate below the perianth. Perianth segments 5, free or connate at base,

sepaloid or petaloid, imbricate, sometimes accrescent and juicy in fruit. Disc annular or glandular. Stamens 5-8; filaments often dilated at base; anthers dorsifixed. Ovary superior, 1-locular, with one basal ovule, biconvex (compressed) with 2 styles or trigonous with 3 styles; stigmas capitate. Fruit a nut, covered by the persistent perianth.

1 Leaves less than 0.3 cm broad.....*P. plebeium*
1 Leaves more than 1 cm broad.
2 Flowers in heads.
3 Styles 3; nuts trigonous. Leaves more than 3 cm broad.....*P. chinense*
3 Styles 2; nuts biconvex. Leaves less than 2 cm broad.....*P. pedunculare*
2 Flowers in simple or panicled racemes.
4 Ocreae glabrous and not ciliate (styles 2; nut biconvex).....*P. glabrum*
4 Ocreae strigose and/or ciliate.
5 Racemes slender, lax.....*P. hydropiper*
5 Racemes dense, tight.
6 Styles usually 2; nuts usually biconvex.....*P. pulchrum*
6 Styles usually 3; nuts usually trigonous.
7 Leaves glabrescent.....*P. barbatum*
7 Leaves hispid.....*P. stagninum*

Polygonum barbatum L., Sp. Pl. 362. 1753; Wight, Ic. t. 1798. 1852; Gamble, Fl. Madras 1189(833). 1925.

Large herbs; stem glabrescent. Ocreae strigose, 1.5 cm long, with long cilia equaling the tube; leaf blade lanceolate, acuminate, rounded at base, to 12×1.5 cm, sparsely pubescent along the nerves and margin. Racemes terminal, 5 cm long; bracts close, ciliate. Perianth white. Styles 3. Nut trigonous.

Paleotropics. Rare; collected once along a stream at Belur on August 13, 1967. *CJS* 10863.

Polygonum chinense L., Sp. Pl. 363. 1753; Wight, Ic. t. 1806. 1852; Gamble, Fl. Madras 1190(833). 1925.

Scandent, large herbs or undershrubs; stem glabrous. Ocreae 2-4 cm long; leaf blade crenulate along the margin, elliptic-ovate, acute or shortly acuminate at apex, truncate at base, to 8×4 cm, sparsely pubescent beneath. Heads in terminal, corymbose panicles; peduncle glandular-hairy; bracts glabrous. Perianth white. Styles 3. Nut trigonous.

Indomalaysia. Scattered in upper Ghats. All seasons. *CJS* 12556, 15976.

Polygonum glabrum Willd., Sp. Pl. 2: 447. 1799; Wight, Ic. t. 1797. 1852; Gamble, Fl. Madras 1189(832). 1925.

Glabrescent undershrubs. Ocreae closely sheathing the stem, 3 cm long; leaf blade elliptic-ovate or lanceolate, acuminate at apex, narrowed into a petiole at base, to 16×2 cm, gland-dotted. Racemes in terminal panicles; bracts close. Perianth pink or red. Styles 2. Nuts biconvex.

Fig. 20. POLYGONACEAE. *A. Polygonum hydropiper*: flowering branch; *Aa*, flower; *Ab*, pistil. *B. Polygonum pedunculare*: capitate inflorescence; *Ba*, longitudinal section of flower; *Bb*, pistil. *C. Polygonum pulchrum*: biconvex fruit. *D. Polygonum barbatum*: trigonous fruit.

Pantropics. Common in plains at margins of tanks and streams. All seasons. *CJS* 13686, 13929.

Polygonum hydropiper L., Sp. Pl. 361. 1753; Gamble, Fl. Madras 1190(933). 1925.

1 Ocreae glabrous.....var. *hydropiper*
1 Ocreae strigose.....var. *flaccidum*

var. **hydropiper**

Herbs; stem glabrous. Ocreae 2 cm long, shortly ciliate; leaf blade lanceolate, acuminate, acute at base, to 8×1 cm, glabrous, gland-dotted. Raceme terminal, slender, in panicles or not, lax; cilia of bracts caducous. Perianth white. Styles 3. Nuts trigonous.

Tropics, Western Europe. Rare along the river beds in plains and upper Ghats. April-May. *CJS* 16720, 16845.

var. **flaccidum** Steward, Contr. Gray Herb. 88: 59. 1930; Sant. & Wagh, Bull. Bot. Surv. India 5: 108. 1964. *Polygonum flaccidum* auct., non Roxb., 1832: Meisner in DC., Prodr. 14(1): 107. 1856; Gamble, Fl. Madras 1190(833). 1925. *Polygonum donii* Wight, Ic. t. 1801. 1852.

Large herbs. Ocreae 2 cm long, strigose, prominently ciliate; leaf blade elliptic-lanceolate, acuminate, shortly narrowed into a petiole, to 11×2.5 cm, gland-dotted, pubescent beneath. Panicle longer. Perianth rosy.

Indomalaysia. Rare; collected once from marshes at Malvinakulu, along Hanbal road (upper Ghats) on November 13, 1971. *HFP* 2490.

Note: One specimen (*CJS* 11597) collected near Yethinahalla bridge (upper Shiradi Ghat) resembles *P. hydropiper* except for its 2 styles and biconvex nuts. It is for the present being treated as an anomalous *P. hydropiper* var. *flaccidum* with strigose ocreae.

Polygonum pedunculare Wall. [List. 1718. 1829, *nom.*] ex Wight, Ic. t. 1802C. 1852; Meisner in DC., Prodr. 14(1): 133. 1856; Gamble, Fl. Madras 1191(834). 1925.

Undershrubs; stem more or less minutely prickly. Ocreae glabrous, 2.5 cm long; leaf blade lanceolate, acuminate, narrowed at base into a distinct petiole, to 9 × 1.6 cm, softly ciliate. Heads in slender, dichotomous cymes; peduncle glandular; bracts pubescent. Perianth white, sometimes tinged with pink. Styles 2. Nuts biconvex.

Asia, Australia. Frequent along river beds in upper Ghats. All seasons. *CJS* 15265, 15961.

Note: *P. dichotomum* Blume (1826) has been referred to this taxon and, if true, would be the priorable name. One collection (*CJS* 12207) has 3 styles and trigonous fruits.

Polygonum plebeium R. Br., Prodr. 420. 1810 ('*plebejum*'); Gamble, Fl. Madras 1188(832). 1925; Sant., Fl. Khandala ed. 3, 226. 1967.

Diffuse, slender herbs. Ocreae small; leaf blade linear, to 1×0.2 cm.

Flowers in axillary and terminal clusters; bracts membranous. Perianth pink. Styles 3. Nuts trigonous.

Paleotropics. Scattered across plain, in moist places. March-July. *HFP* 56, 1745.

Note: The spelling change from *plebejum* to *plebeium* is required by Art. 73, the "j" being used as a vowel, must be changed to "i". In this case it is part of the diphthong, "ei".

Polygonum pulchrum Blume, Bijd. 530. 1826; Sant. & Wagh, Bull. Bot. Surv. India 5: 108. 1964. *Polygonum tomentosum* Willd., Sp. Pl. 2: 447. 1799; Gamble, Fl. Madras 1189(832). 1925, non Schrank, 1789.

Softly silky-tomentose large herbs. Ocreae closely sheathing the stem, 2-3.5 cm long, ciliate; leaf blade elliptic-lanceolate, acuminate, cuneate at base, 20×4 cm. Inflorescence a terminal panicle; bracts close, ciliate. Perianth white. Styles 2. Nuts biconvex.

Tropics. Occasional along Hassan-Saklespur road. August-December. *CJS* 12013, *HFP* 2047.

Polygonum stagninum Ham. ex Meisner in Wall., Pl. As. Rar. 3: 56. 1832; J. Hooker, Fl. Brit. India 5: 37. 1886.

Undershrubs; stem strigose, later glabrous. Ocreae strigose, 2.5 cm long, ciliate; leaf blade lanceolate, acuminate, shortly petiolate at base, pubescent, to 12×1.4 cm. Inflorescence a terminal panicle, pubescent; bracts close, ciliate. Perianth white. Styles 3. Nuts trigonous.

India, Burma. Collected once along the banks of a stream near Saklespur (upper Ghat) on May 29, 1969. *CJS* 13691.

Note: Some botanists synonymise *P. stagninum* under *P. barbatum.*

28. PLUMBAGINACEAE

T. P. Ramamoorthy

PLUMBAGO Linnaeus

Usually perennial herbs or undershrubs. Leaves alternate, sometimes rosulate at base, estipulate, simple, entire, usually pale-lepidote below with calcium carbonate excretions, pinnately veined. Inflorescence usually terminal, of spiciform racemes. Flowers sessile, bisexual, regular, 5-merous, bracteate, 2-bracteolate. Calyx gamosepalous, ribbed, densely glandular, imbricate. Corolla gamopetalous, imbricate. Stamens 5, free. Ovary superior, 1-locular, with a solitary, basal ovule; style usually 5-fid. Fruit a 1-seeded, circumscissile capsule.

Plumbago zeylanica L., Sp. Pl. 151. 1753; Gamble, Fl. Madras 744(524). 1921.

Fig. 21. DILLENIACEAE. *A. Dillenia pentagyna*: flowering branch; *Aa*, flower bud; *Ab*, flower; *Ac*, section of ovary; *Ad*, section through gynoecium and androecium; *Ae*, gynoecium with one carpel removed.

Scandent undershrubs. Leaves 5×3.5 cm, ovate, acute; petiole auricled. Calyx green, covered with many, stalked red-tipped glands. Corolla white.

Tropics. Common in disturbed areas. All seasons. *CJS* 10845, *HFP* 2090.

Note: *Plumbago auriculata* Lam. with light blue flowers is cultivated in flower gardens.

29. DILLENIACEAE

T. P. Ramamoorthy

DILLENIA Linnaeus

Trees, often deciduous; bark peeling off in thin flakes. Leaves alternate, estipulate, simple, entire to dentate, pinnately veined. Inflorescence of racemes, fascicles or of solitary flowers. Flowers bisexual, usually 5-merous, regular. Sepals free, imbricate, usually accrescent; petals free, fugacious, rarely 0. Stamens many, in many series; anthers 2-celled, dehiscing longitudinally. Pistils 1-20, superior, coherent along a central axis; ovules many, axile; styles filiform, recurved. Fruit indehiscent, covered by the accrescent calyx, or dehiscent, with stellately spreading carpels. Seeds usually arillate.

Dillenia pentagyna Roxb., Pl. Cor. t. 20. 1795; Gamble, Fl. Madras 8(4). 1915; Hoogland, Blumea 7: 117. 1952.

Trees to 15 m. Leaves to 60×20 cm, oblong-lanceolate, narrowed at base, acute at tip; veins 40-50 pairs, apiculate, densely hairy on the back when young; petiole somewhat winged at base, channeled. Flowers fascicled on lateral tubercles on old wood, appearing before leaves; pedicel to 6 cm long, red. Sepals 5, orbicular, brown, thick, accrescent; petals 5, obovate, bright yellow. Innermost 10 stamens longer than the rest and recurved; anthers dehiscing longitudinally. Pistil of 5 subattached carpels, each with a style and unilocular. Fruit indehiscent, fleshy, yellow with fleshy sepals.

China to Indomalaysia. Common in semi-evergreen forests along middle and upper Ghats. January-April. *CJS* 12939, 13271.

30. OCHNACEAE

T. P. Ramamoorthy

OCHNA Linnaeus

Woody. Leaves alternate; stipules intrapetiolar, connate, deciduous;

Fig. 22. OCHNACEAE. *A. Ochna obtusata* var. *gamblei*: flowering branch; *Aa*, flower; *Ab*, same longitudinal section; *Ac*, young fruit.

blade simple, entire, pinnately veined. Inflorescence of cymose or thyrsoid panicles; peduncle usually persistent, bearing conferted, small, caducous bracts. Flowers bisexual, regular, with hemispherical, distinctly tumid torus turning red with age. Sepals 5, free or shortly connate, accrescent; petals 5-10, free, caducous. Stamens many; anthers with 2 apical pores. Ovary superior, 5-10-lobed; ovule 1 in each locule, axile; style gynobasic, persistent. Fruits of 3-5 drupes on swollen torus, each 1-seeded.

Ochna obtusata DC., Ann. Mus. Paris 17: 411. 1811; Robson, Taxon 11: 51. 1962; *Ochna squarrosa* auct., non L.: Roxb., Pl. Cor. t. 89, 1775; Gamble, Fl. Madras 165(118). 1915.

var. **gamblei** (Brandis) Kanis, Blumea 16: 34. 1968. *Ochna gamblei* King ex Brandis, Indian Trees 128. 1906; Gamble, Fl. Madras 166(118). 1915. *Ochna beddomei* Gamble, [Fl. Madras 166(118). 1915, *nom.*] Bull. Misc. Inform. 34. 1916.

Leaves waxy, shortly petiolate, elliptic-ovate to obovate, obtuse to rounded at apex. Inflorescence cymosely paniculate, extra-axillary, many-flowered, on short 1-2 cm peduncle. Anthers (7 mm) more than twice the length of filaments (3 mm). Sepals suberect in fruit.

Central & S. India. Common in the dry hills of Karekalgudda, n. east of Arsikere. March-June. *CJS* 16604, *HFP* 157.

31. DIPTEROCARPACEAE

T. P. Ramamoorthy

Unarmed, resiniferous, large trees. Leaves alternate; stipules usually deciduous; blade simple, coriaceous, entire or crenate, pinnately veined. Inflorescence a panicle of racemes or spikes, axillary or terminal; flowers bisexual, regular, bracteolate. Sepals connate, 5-lobed, imbricate, persistent; petals 5, free, contorted. Stamens 5, 10 or 15, sometimes numerous, in 1-many whorls; filaments usually free, short, dilated below and connate (this part persistent); anthers 2-celled, dehiscing longitudinally; connectives mostly prolonged into awns. Ovary superior, rarely inferior, generally 3-locular; ovules 2 in each locule, parietal; style simple; stigma rarely divided. Fruit 3-valved, 1-seeded, either a dry nut, enclosed by accrescent calyx, 1-3 lobes of which elongate and simulate wings, or fleshy. Cotyledons usually lobed.

1 Stipules or stipular scars encircling stem.....**Dipterocarpus**
1 Stipules or stipular scars not encircling stem.
2 Petioles swollen, appressed tomentose.....**Hopea**
2 Petioles not swollen, glabrous.

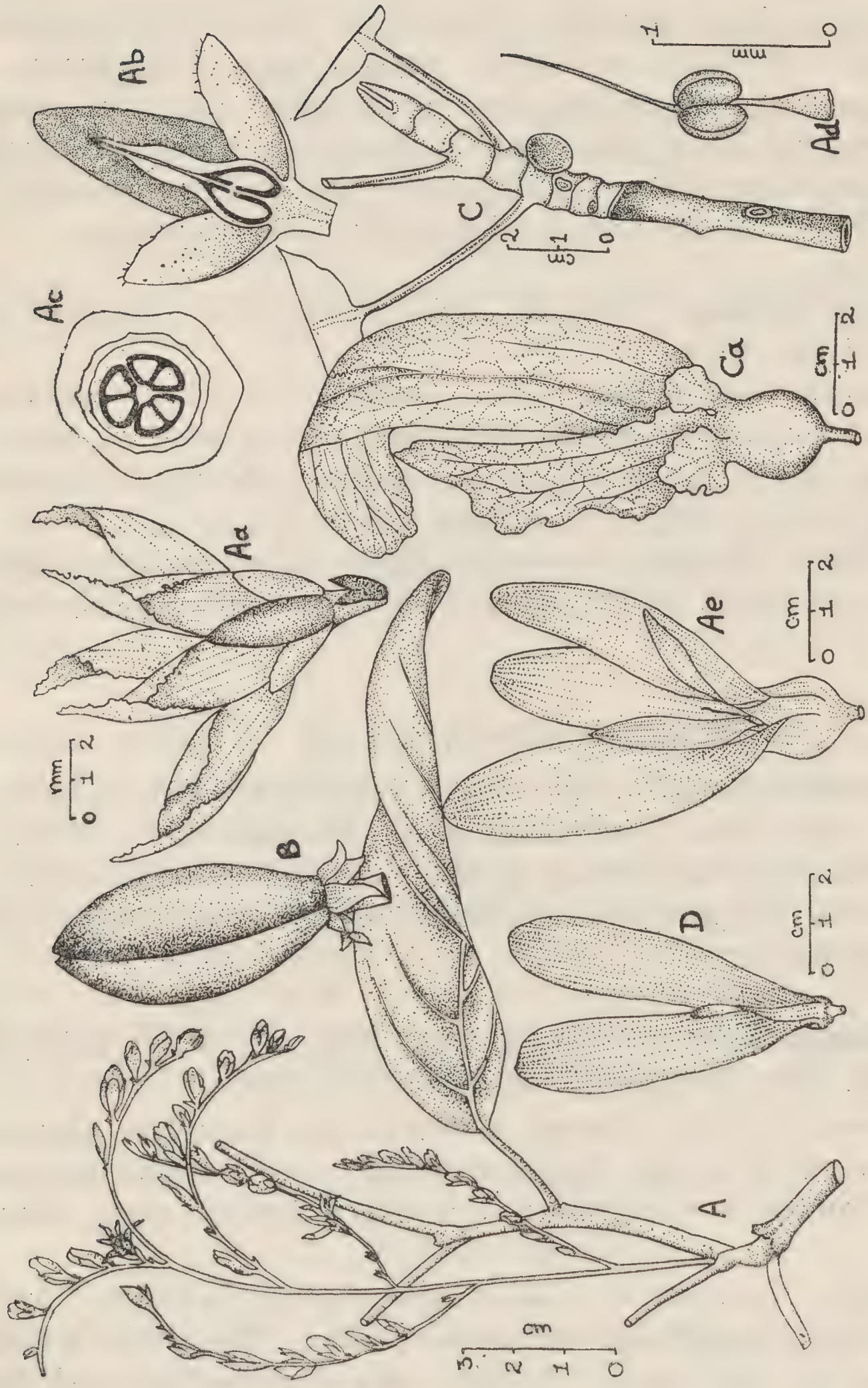


Fig. 23. DIPTEROCARPACEAE. *A. Hopea wightiana*: flowering branch; *Aa*, flower, side view; *Ab*, same, vertical section; *Ac*, ovary, cross section; *Ad*, stamen; *Ae*, fruit. *B. Vateria indica*: fruit. *C. Dipterocarpus indicus*: twig showing stipular scars; *Ca*, fruit. *D. Shorea roxburghii*: fruit.

3 Petals pubescent; fruiting calyx with 3 accrescent lobes.....**Shorea**
3 Petals glabrous; fruiting calyx persistent, not accrescent.....**Vateria**

DIPTEROCARPUS C. Gaertner

Leaves entire or sinuate-dentate; stipules large, hairy, covering terminal bud, ultimately deciduous leaving an annular scar. Inflorescence of simple or branched, axillary, few-flowered racemes. Calyx tube rather large, with unequal lobes; petals usually puberulous without, contorted in bud. Stamens numerous; filaments short; anthers linear; connective acuminate. Fruit nut-like with 2 of the calyx lobes accrescent.

Dipterocarpus indicus Bedd., Fl. Sylv. t. 94. 1871; Gamble, Fl. Madras 81(58). 1915.

Lofty, deciduous trees to over 30 m. Leaves to 17×8 cm, ovate, acute at tip, truncate-subcordate at base, glabrous, entire, with 16 pairs of pinnate veins. Petals puberulous on the outside. Accrescent lobes of fruiting calyx to 7×2 cm, erect, oblong, red.

South W. India. Frequent in semi-evergreen forests in lower Ghats. March. An important timber tree, used extensively for plywoods. *CJS* 16679.

HOPEA Roxburgh *nom. cons.*

Stipules deciduous, small. Inflorescence a panicle of racemes, axillary or terminal. Calyx with 2 lobes enlarging. Stamens 10-15; filaments obscurely connate at base; anthers globose; connective produced into a conspicuous awn. Stigma thick. Fruit nut-like, enclosed in calyx tube, with 2 lobes accrescent.

Hopea wightiana Wall. ex Wight & Arn., Prodr. 85. 1834; Bedd., Fl. Sylv. t. 96. 1871; Gamble, Fl. Madras 82(59). 1915.

Evergreen trees to 20 m. Leaves to 24×6.5 cm, lanceolate, abruptly acute, subtruncate at base. Sepals glabrous; petals ovate-lanceolate, pubescent. Stamens 15. Accrescent calyx lobes to 5×2 cm, erect, oblong, reddish.

South W. India. Common in semi-evergreen forests in Ghats. April-May. The wood is strong and used commercially. The species is easily distinguishable by the echinate axillary and extra-axillary 'gall-like' excrescenses. *CJS* 13307, 13780, 16943.

SHOREA Roxburgh ex C. Gaertner

Stipules small and deciduous or large and persistent. Inflorescence a

panicle of racemes, axillary. Sepals glabrous, subequal; petals pubescent. Stamens 15-many; anthers linear. Ovary hairy. Fruit nut-like, enclosed in calyx tube, with 3 lobes accrescent.

Shorea roxburghii G. Don, Gen. Syst. 1: 813. 1831. *Shorea talura* Roxb. [Hort. Beng. 93. 1814, *nom.*], Fl. Ind. 2: 618. 1832; Gamble, Fl. Madras 83(60). 1915.

Deciduous trees to 10-12 m. Leaves to 8×5 cm, elliptic, acute and emarginate at tip, subcordate at base. Petals white, pubescent on the outside. Stamens 15; stigma 3-fid. Accrescent lobes of fruiting calyx to 5×1.5 cm, oblong, erect, turning red.

South W. India. Common, frequently planted in the plains for timber. February-March. *CJS* 16689, *HFP* 1280.

VATERIA Linnaeus

Stipules small and deciduous, rarely large. Panicle terminal or axillary, often densely stellate-tomentose. Calyx lobes equal, persistent, reflexed, not accrescent; petals glabrous. Stamens 15 or more; anthers linear; connectives rarely produced. Stigma entire. Fruit 3-valved, 1-seeded.

Vateria indica L., Sp. Pl. 515. 1753; Gamble, Fl. Madras 85(61). 1915. *Vateria malabarica* Blume, Mus. Bot. Lugd.-Bat. 2: 29. 1856; Bedd., Fl. Sylv. t. 84. 1871.

Large evergreen trees to 15-20 cm. Leaves to 20×11 cm. Stipules small, thick, deciduous. Flowers white. Stamens 15. Fruit fleshy, elliptic.

South W. India. Abundant in middle and lower Ghats. February-April. The wood is of commercial value especially in the plywood industry. The resin which oozes from wounds on the trunk makes a good varnish and is burnt as incense. *CJS* 10960, 16548, *HFP* 1458.

32. THEACEAE

T. P. Ramamoorthy

Usually unarmed shrubs or trees. Leaves alternate, estipulate, simple, usually serrate, pinnately veined. Inflorescence of racemes, fascicles, or of a solitary flower. Flowers bisexual or unisexual, regular, pedicelled, usually bracteolate; sepals usually 5, free or shortly connate at base, imbricate; petals 5, free or shortly connate, imbricate. Stamens 5-many; anthers 2-celled, dehiscing longitudinally, rarely poricidal. Ovary superior or half-inferior, usually 2-6-locular; ovules 2-many, rarely

Fig. 24. THEACEAE. *A. Gordonia obtusa*: flowering twig; *Aa*, flower showing calyx; *Ab*, same, viewed from above; *Ac*, fruit; *Ad*, seed. *B. Eurya japonica*: vertical section of male flower; *Ba*, transverse section of ovary; *Bb*, fruit; *Bc*, vertical section of fertile ovary.

solitary, axile; styles 1-6, free or partly connate. Fruit a berry or septicidal or loculicidal capsule, leaving a central column. Seeds many, smooth or tuberculate, sometimes angled or winged.

1 Flower solitary, to 5 cm across; fruit capsular.....**Gordonia**
1 Flowers fascicled, to 0.5 cm across; fruit a berry.....**Eurya**

EURYA Thunberg

Leaves crenate-serrate, usually glabrous. Flowers unisexual, pedicelled, bracteolate. Sepals unequal; petals rarely to 7, sometimes shortly connate at base. Stamens 10-30, free or shortly connate, adnate to corolla-base. Styles 2-6. Fruit a berry; seeds usually tuberculate, angled.

Eurya japonica Thunberg, Fl. Jap. 191, t. 25. 1784; Bedd., Fl. Sylv. t. 92. 1871; Gamble, Fl. Madras 79(57). 1915.

Shrubs to 4 m. Leaves to 9×3.5 cm, shortly petioled, elliptic, glabrous. Flowers fascicled. Sepals orbicular; petals orbicular, white. Stamens 12-15, free. Ovary 3-locular; styles 3. Seeds tuberculate.

India to Japan, Fiji. Common, in open semi-evergreen forests in upper Ghats. All seasons. *CJS* 15928, *HFP* 520.

GORDONIA Ellis *nom. cons.*

Usually large evergreen trees. Leaves entire or crenate. Flowers axillary, solitary, usually towards apices of branches, bisexual, bracteolate. Sepals 4-5, unequal, inner ones larger; petals larger, free or connate at base, united with the stamens. Stamens many, monadelphous or pentadelphous. Ovary 3-6-locular; ovules 2-8 in each cell; style branching into 3-6 stigmas. Fruit a 3-6-valved capsule, leaving a central column after dehiscence. Seeds compressed, winged.

Gordonia obtusa Wall. ex Wight & Arn., Prodr. 87. 1834; Gamble, Fl. Madras 79(57). 1915.

Leaves to 12.5×4.5 cm, shortly petioled, oblong-lanceolate, crenate, glabrous. Sepals rounded; petals broadly orbicular, notched at tip or somewhat erose, white. Ovary 3-locular, white-pubescent; stigmas 3. Capsule dehiscing into 3 valves.

South W. India. Common, in sholas and evergreen forests in the Ghats. December-January. The wood is easy to work and occasionally used for rafts and building purposes. *CJS* 15901, *HFP* 1317. (Plate 2).

Note: *Camellia sinensis* (L.) Kuntze, the tea plant, is cultivated at Kadamane, in upper Ghats.

Fig. 25. ELATINACEAE. *A. Bergia ammannioides*: habit; *Aa*, flowering twig; *Ab*, flower; *Ac*, vertical section of flower; *Ad*, fruit with persistent floral whorls.

33. ELATINACEAE

T. P. Ramamoorthy

BERGIA Linnaeus

Herbs of wet habitats. Leaves opposite; stipules persistent; blade serrate. Flowers in axillary fascicles, bisexual, regular. Sepals 3-5, free or shortly connate, imbricate, strongly 1-nerved on back, scarious along margin; petals as many. Stamens 3-5, free; anthers 2-celled, dehiscing longitudinally. Ovary superior, 2-5-locular; ovules many, axile; styles as many as carpels, short; stigma globose. Capsule septicidal, 3-5-valved; seeds many, minute.

Bergia ammannioides Roxb., Hort. Beng. 34. 1814; Roth, Nov. Pl. Sp. 219. 1821; Robinson, Philipp. J. Sci. 7: 414. 1912; Gamble, Fl. Madras 69(50). 1915. *Lechea verticillata* Willd., Sp. Pl. 1: 495. 1797 [non *Bergia verticillata* Willd.].

Glandular pubescent, prostrate annuals. Leaves to 0.8×0.4 cm. Sepals concave, keeled, acute to acuminate. Capsule 5-valved.

Pantropical. Frequent in fallow rice fields. April. *CJS* 9589, 9590, 9591.

34. CLUSIACEAE

K. N. Gandhi

Trees, shrubs or rarely herbs, often with colored sap. Leaves opposite, sometimes verticillate; stipules generally absent; blade simple, entire, gland dotted or lined. Inflorescence an axillary or terminal cyme, raceme, panicle, fascicle or flowers solitary; bracts caducous. Flowers polygamous, regular. Sepals 4-5, rarely many, free, imbricate, persistent or caducous, inner ones sometimes petaloid. Petals 4-5, rarely many or none, free, imbricate, valvate or contorted. Stamens usually many, rarely few, free or united in clusters (phalanges); anthers 2-celled or 4-celled. Pistillode present or absent in staminate flowers. Rudimentary stamens sometimes present in pistillate flowers. Ovary superior, sessile, 1-many-locular; ovules 1-many per locule, axillary, basal or parietal; styles 1-2 or absent; stigmas 1-many, often peltate or radiating. Fruit a capsule, berry or drupe, 1-many-seeded.

1 Herbs or shrubs; leaves sessile, membranous, gland-dotted. Sap milky..... **Hypericum**

1 Trees; leaves shortly petiolate, coriaceous, opaque or gland-dotted. Sap colored.

2 Lateral venation differentiated into primary and secondary, reticulate. Style absent; stigma radiate..... **Garcinia**
2 Lateral venation undifferentiated, striate. Style elongate; stigma peltate.
3 Flowers small (less than 1 cm across). Leaves not glaucous. Branchlets 4-angled ..... **Calophyllum**
3 Flowers large (more than 3 cm across). Leaves glaucous. Branchlets terete..... ..... **Mesua**

CALOPHYLLUM Linnaeus

Large trees or shrubs; branchlets 4-angular. Leaves coriaceous, with numerous, striate lateral nerves. Flowers pedicelled. Sepals usually 4. Petals 0 or 4, imbricate. Stamens many, free or in phalanges; anthers 2-celled. Ovary unilocular; ovule solitary, basal; style 1, slender; stigma peltate. Fruit a drupe, 1-seeded.

Calophyllum apetalum Willd., Ges. Naturf. Freunde Berlin Mag. Neuesten 5: 79. 1811; Maheswari, Bull. Bot. Surv. India 2: 143. 1960. *Calophyllum decipiens* Wight, Ic. t. 106. 1839; Ill. 1: 128. 1840; Gamble, Fl. Madras 76(54). 1915. *Calophyllum wightianum* Wall. [List. 4847. 1831, *nom.*] ex Planchon & Triana, Ann. Sci. Nat. Bot. ser. 4, 15: 256. 1861; Bedd., Fl. Sylv. t. 90. 1871.

Tree to 30 m. Petiole 0.5 cm long; leaf blade obovate or oblong, obtuse-retuse at apex, rounded at base, to 10×4 cm. Racemes axillary, shorter than leaves. Flowers white; pedicels to 1.5 cm long. Sepals 4, biseriate, petaloid, white. Petals 0. Drupe elliptic, 1 cm long, red with age.

Western Ghats. Common along the banks of Kempuhole (lower Shiradi Ghat). September-February. *CJS* 11617, *HFP* 927.

GARCINIA Linnaeus

Trees. Leaves coriaceous; lateral nerves reticulate. Inflorescence an axillary or terminal umbel, raceme, fascicle or flowers solitary. Flowers pedicelled. Sepals 4-5, persistent. Petals 4-5, imbricate. Stamens numerous, free or in few free or connate phalanges; anthers 2-celled or 4-celled, erect, reniform or annular with longitudinal or circumscissile dehiscence. Rudimentary ovary often present in staminate flower. Staminodes free or connate in pistillate flower. Ovary 2-12-locular, each locule with solitary, axile ovule; stigmas 2-12, sessile, radiate, entire or lobed, smooth or tubercled. Fruit a berry; seeds few-many, enclosed in pulpy aril.

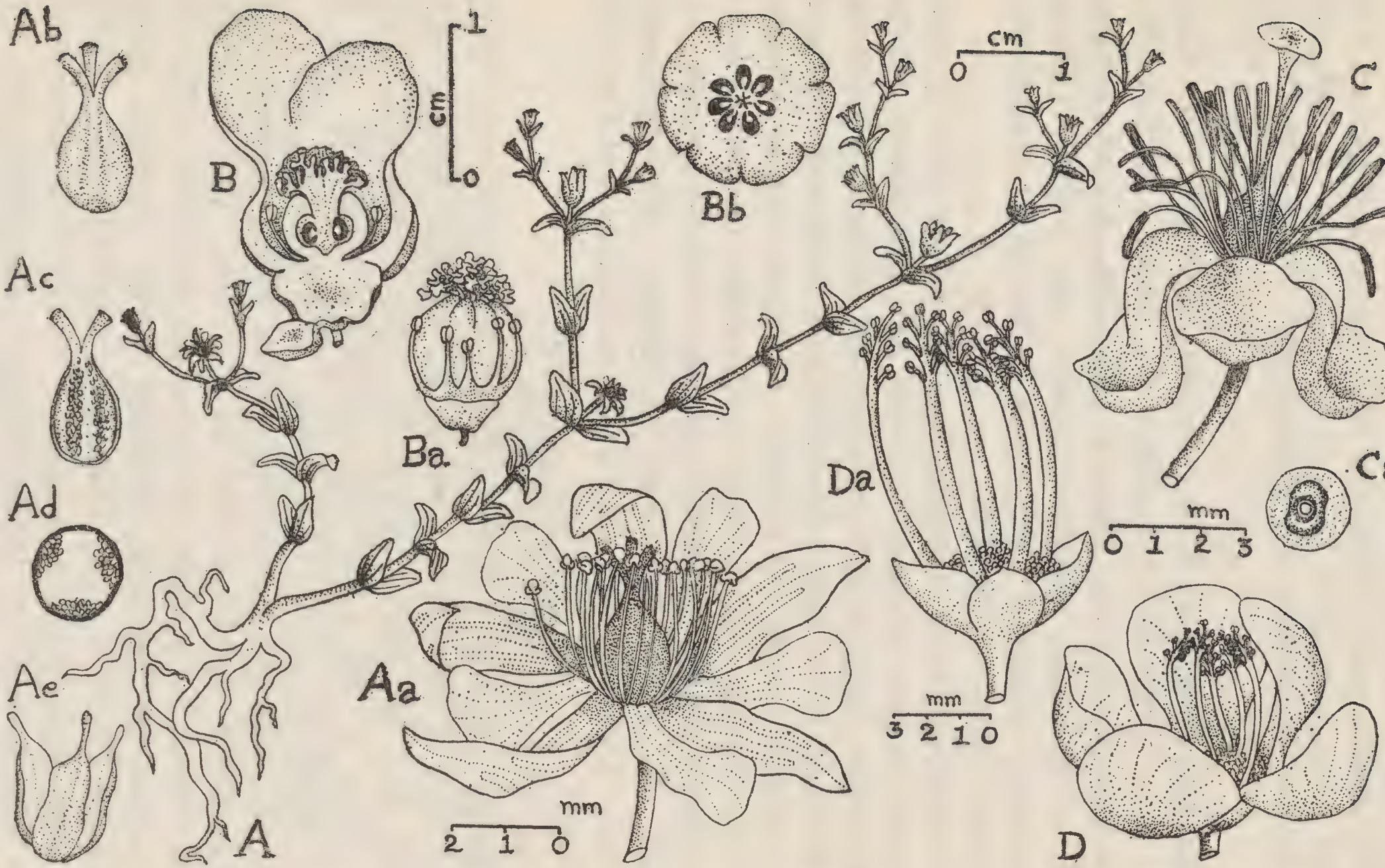


Fig. 26. CLUSIACEAE. *A. Hypericum japonicum*: habit; *Aa*, flower; *Ab*, ovary; *Ac*, same, vertical section; *Ad*, same, transverse section: *Ae*, dehisced capsule. *B. Garcinia cambogia*: vertical section of pistillate flower; *Ba*, pistillate flower showing staminodes; *Bb*, transverse section of ovary. *C. Calophyllum apetalum*: bisexual flower; *Ca*, transverse section of ovary. *D. Garcinia talbotii*: staminate flower; *Da*, same, without petals.

1 Sepals and petals 5, rarely petals 4; stamens in 5 phalanges.
2 Mature leaves acute, more than 20 cm long; pedicels much longer than flowers. Stigmas 5-6 ..... *G. xanthochymus*
2 Mature leaves rounded, to 16 cm long; pedicels shorter or equaling flowers. Stigma 3-4 ..... *G. talbotii*
1 Sepals and petals 4; stamens in a single mass.
3 Stigmas 4; anthers peltate, adnate, pluri-locular with circumscissile dehiscence. Fruits smooth ..... *G. morella*
3 Stigmas 8-11; anthers free, bilocular with dehiscence by 2 vertical clefts; fruits 6-8-grooved ..... *G. cambogia*

Garcinia cambogia (Gaertner) Desr. in Lam., Encycl. 3: 701. 1792; Bedd., Fl. Sylv. t. 85. 1871; Gamble, Fl. Madras 73(53). 1915. *Mangostana cambogia* Gaertner, Fruct. 2: 106. 1790. *Garcinia conicarpa* Wight, Ic. t. 121. 1839. *Garcinia cambogia* var. *conicarpa* (Wight) T. Anderson in J. Hooker, Fl. Brit. India 1: 262. 1874; Maheshwari, Bull. Bot. Surv. India 6: 129. 1965.

Petiole 2 cm long; leaf blade elliptic-oblong or obovate, shortly acute to obtuse at apex, cuneate at base, to 12×5 cm. Staminate flowers 15-20-fascicled, on new (leafy) or old (leafless) wood; stamens in a globular mass slightly raised above the receptacle; anther cells contiguous, dehiscing longitudinally; pistillode with 3-4 stigmas. Pistillate flowers solitary; staminodes in an irregular ring; ovary 6-12-locular, grooved. Berry elliptic-oblong or suborbicular, mamillar at apex, with 6-8 grooves.

Western Ghats, Sri Lanka. Common in Ghats. January-August. *CJS* 11600, 13875. The dried rind of the fruit is used in place of Tamarind for flavoring curries.

Note: Many varieties are recognized by Maheshwari (*l.c.*).

Garcinia morella (Gaertner) Desr. in Lam., Encycl. 3: 701. 1792; Bedd., Fl. Sylv. t. 86. 1871; Gamble, Fl. Madras 73(52). 1915; Maheshwari, Bull. Bot. Surv. India 6: 182. 1965. *Mangostana morella* Gaertner, Fruct. 2: 106. 1790. *Garcinia pictoria* Roxb., Fl. Ind. 2: 627. 1832; Wight, Ic. t. 102. 1839; Bedd., Fl. Sylv. t. 87. 1871.

Petiole to 0.5 cm long; leaf blade elliptic-ovate, bluntly acuminate at apex, rounded or shortly cuneate at base, to 12×7 cm. Flowers subsessile. Staminate flowers 1-3-fascicled on old wood; stamens in a globular mass; anthers peltate, circumscissile, pistillode absent. Pistillate flowers solitary; staminodes 10-12, connate at base. Ovary 4-locular; stigmas sessile. Berry globose, smooth, 2.5 cm across.

Indomalaysia. Occasional in lower Ghats. October-April. *CJS* 15427, *HFP* 132.

Note: Maheshwari (*l.c.*) accepts *G. pictoria* Roxb. but notes that it is "allied to *Garcinia morella* and scarcely distinguishable except by the female flowers."

Garcinia talbotii Raizada ex Sant., Fl. Khandala ed. 2, 14. 1960; Maheshwari, Bull. Bot. Surv. India 6: 113. 1965. *Garcinia ovalifolia*

var. *macrantha* T. Anders. in J. Hooker, Fl. Brit. India 1: 269. 1874. *Garcinia malabarica* Talbot, J. Bombay Nat. Hist. Soc. 11: 234, t. 1. 1897; Gamble, Fl. Madras 74(53). 1915, non Desr., 1789.

Branchlets angular. Petiole 1-1.5 cm long; leaf blade broadly oblong, obtuse at apex and base, to 14×7 cm. Staminate flowers congested in short racemes, on old wood, pedicelled; corolla greenish-white; phalanges of stamens 5, free; pistillode absent. Pistillate flowers fascicled on old wood; phalanges of rudimentary stamens present; ovary 3-4-locular. Berry subglobose, yellow, 4-6 cm across.

Western Ghats. Collected once in flower (staminate) along the road in lower Bisle Ghat on January 8, 1970. *CJS* 16027.

Garcinia xanthochymus J. Hooker ex T. Anderson in J. Hooker, Fl. Brit. India 1: 269. 1874; Maheshwari, Bull. Bot. Surv. India 6: 114. 1965; Sant., Fl. Khandala ed. 3, 14. 1967. *Garcinia tinctoria* Dunn in Gamble, Fl. Madras 74(53). 1915.

Petiole 1-1.5 cm; leaf blade oblong, acute, rounded at base, to 30×8 cm. Flowers fascicled on old wood, distinctly pedicelled, white. Phalanges of stamens 5, free, alternating with 5 glands. Rudimentary staminal phalanges few in pistillate flower. Ovary 5-locular. Berry globular, smooth, turning yellow with age, 6 cm across.

Indomalaysia. Occasional at edges of forest in upper Ghats. Striking for their large leaves. Flowering in February-May, fruiting in November-February. *CJS* 12431, *HFP* 204.

HYPERICUM Linnaeus

Herbs, shrubs, rarely trees. Leaves opposite or whorled, sessile, glandular-punctate; venation pinnate. Inflorescence of terminal or lateral fascicles, dichasial or monochasial cymes or flowers solitary. Flowers bisexual, pedicelled. Sepals 5. Petals 5, contorted in bud. Stamens few-many, free or in phalanges; filaments slender; anthers 2-celled. Ovary 1-locular with 3-5 parietal placentas or 3-5-locular with axile placentation, many-ovuled; styles free or basally connate. Fruit a septicidal capsule.

1 Herbs. Flowers less than 1 cm across.....*H. japonicum*
1 Shrubs. Flowers more than 2 cm across.....*H. mysurense*

Hypericum japonicum Thunberg ex Murr., Syst.Veg. ed. 14, 1702. July, 1784; Thunb., Fl. Jap. 295, t. 31. Aug., 1784: Gamble, Fl. Madras 70(50). 1915; Robson, Blumea 20: 267. 1972.

Erect or procumbent, slender, branched herbs. Leaves elliptic-ovate-lanceolate, obtuse or subacute at apex, cordate, to 0.6-1×0.3-0.6 cm; venation subpalmate, 3-5-nerved. Cyme terminal, initially dichasial then monochasial; upper bracts linear-lanceolate, 0.2-0.3 cm long.

Flowers 0.8-1 cm across. Sepals entire, oblong or narrowly elliptic, 5 mm long. Petals yellow, 3-5 mm long, persistent. Stamens 5-25, connate at base. Ovary 1-locular; styles 3, shorter than ovary. Capsule subcylindrical, 3-5 mm long (excluding the persistent style).

Indomalaysia. Fairly common herbs in dry or marshy fields across the District. February-August. *CJS* 9645, *HFP* 1679.

Note: Robson (*l.c.*) distinguishes 5 variants under *H. japonicum.*

Hypericum mysurense Wight & Arn., Prodr. 99. 1834; Gamble, Fl. Madras 70(50). 1915. *Norisca mysurensis* (Wight & Arn.) Wight, Ic. t. 56. 1838.

Glabrescent shrubs. Leaves decussate, closely arranged, elliptic-lanceolate or oblanceolate, acute at apex, attenuate at base, to 3.5×1.5 cm; venation pinnate. Cyme terminal, few-flowered. Flowers 5-7 cm across. Sepals 5, unequal. Petals yellow, deciduous, 2.5 cm long. Stamens in 5 phalanges, 1.2 cm long. Ovary 5-locular; styles longer than ovary, basally connate. Capsule 1 cm long.

Western Ghats, Sri Lanka. Occasional along the slopes of exposed hills at Genkalbetta (1300 m) and Achihalli. August-February. *CJS* 15922, 17967.

MESUA Linnaeus

Trees. Leaves opposite, petiolate, rigidly coriaceous, with numerous, close, parallel, lateral nerves. Flowers solitary or in pairs, axillary or terminal, large. Sepals 4, poorly differentiated from 4 imbricate petals. Stamens numerous, free or connate at base; anthers 2-celled, linear, erect. Ovary 2-locular, each with 2 basal ovules; style terminal; stigma peltate. Fruit a berry, subtended by the lignified sepals, sometimes 1-locular due to the abortion of the septum, 1-4-seeded.

Mesua ferrea L., Sp. Pl. 515. 1753; Wight, Ic. t. 118. 1839; Gamble, Fl. Madras 77(55). 1915; Maheshwari, Bull. Bot. Surv. India 5: 336. 1964. *Mesua speciosa* Choisy in DC., Prodr. 1: 562. 1824; Wight, Ic. t. 961. 1845. *Mesua pedunculata* Wight, Ic. t. 119. 1839. *Mesua coromandelina* Wight, Ic. t.117. 1839; Bedd., Fl. Sylv. t. 64.1870.

1 Inflorescence glabrous; flowers and fruits shortly but distinctly pedicelled; tepals subequal, all accrescent that are persistent.....ssp. *ferrea*

1 Inflorescence pubescent; flowers and fruits sessile; outer 2-3 tepals smaller than inner and persistent but not accrescent.....ssp. *thwaitesii*

ssp. **ferrea**

Leaves oblong-lanceolate, acuminate at apex, rounded to attenuate at base, pale-green above, glaucous beneath, 9-14×2.5 cm. Flowers shortly pedicelled, 6-8 cm across. Sepals orbicular, 1.8 cm across. Petals

white. Stamens yellow.

Indomalaysia. Occasional trees in upper Ghats. March-July. *HFP* 203, 1448.

ssp. **thwaitesii** (Planchon & Triana) Vesque in A. & C. DC., Mon. Phan. 8: 632. 1893; Maheshwari, Bull. Bot. Surv. India 5: 339. 1964. *Mesua thwaitesii* Planchon & Triana, Ann. Sci. Nat. Bot. ser. 4, 15: 305. 1861; T. Anderson in J. Hooker, Fl. Brit. India 1: 278. 1874.

Leaves elliptic-oblong, acuminate-cuspidate, rounded at base, to 16 × 4.5 cm, pale green above, weakly glaucous beneath. Flowers sessile, 8-10 cm across. Outer 2-3 tepals smaller than inner; inner tepals orbicular, to 2 cm across. Berry ovoid, conical, 3-5 cm long, woody.

South India, Sri Lanka. Collected once in fruit from upper Bisle Ghat on May 4, 1971. *HFP* 1659.

35. ELAEOCARPACEAE

T. P. Ramamoorthy

ELAEOCARPUS Linnaeus

Woody. Leaves alternate; stipules caducous; blade simple, entire or crenate-serrate, pinnately veined, sometimes gland-dotted. Inflorescence usually axillary, sometimes extra-axillary, racemes. Flowers bisexual, regular. Sepals 4-5, free or shortly connate; petals 4-5, usually laciniate at tip; disc annular, glabrous or villous. Stamens many, free; anthers aristate or comose, dehiscing apically by pores. Ovary sessile, 2-5, rarely 1-locular; style subulate; stigma entire. Fruit a drupe; pyrene 1, woody, tuberculate, 1-5-locular, each 1-seeded.

1 Flower 2 cm across; anther aristate.....*E. tuberculatus*
1 Flower less than 2 cm across; anther aristate, bearded or neither.
2 Petals laterally ciliate; anther neither bearded nor aristate.....*E. tectorius*
2 Petals laterally glabrous; anther bearded or aristate.
3 Leaves caudate at tip; anther aristate.....*E. munronii*
3 Leaves acute to narrowed at tip; anther bearded.....*E. serratus*

Elaeocarpus munronii (Wight) Masters in J. Hooker, Fl. Brit. India 1: 407. 1874; Gamble, Fl. Madras 124(88). 1915 ('*munroii*'). *Monocera munronii* Wight, Ill. 1: 84. 1840; Ic. t. 952. 1845.

Large trees. Leaves to 7.5 × 3.5 cm, ovate, ovate-lanceolate, caudate at tip, crenate. Raceme axillary, shorter than leaf, few-many-flowered. Pedicel curving in fruit. Sepals and petals 5 each, the latter white. Anther 2.6 mm, tipped by 0.5 mm long arista. Ovary silky pubescent, 2-locular; ovules 2. Drupe elliptic, 2 cm long, smooth. Pyrene 1-locular.

South W. India. Occasional. Local in distribution, it is found in the

Fig. 27. ELAEOCARPACEAE. *A. Elaeocarpus munronii*: flowering twig; *Aa*, aristate anther. *B. Elaeocarpus tectorius*: anther. *C. Elaeocarpus serratus*: bearded anther. *D. Elaeocarpus tuberculatus*: flower; *Da*, aristate anther; *Db*, section of ovary; *Dc*, pyrene; *De*, same, in section.

shola forests at the foot of Genkalbetta. November-January. *HFP* 881.

Note: Munronius (genitive *munronii*) is a legitimate latinization of Munro, the original form, and should not be modified to *Munroius* (genitive *munroii*).

Elaeocarpus serratus L., Sp. Pl. 515. 1753; Gamble, Fl. Madras 124(88). 1915; Merrill, J. Arnold Arbor. 32: 194. 1951. *Elaeocarpus oblongus* Gaertner, Fruct. 1: 202. 1788.

Large trees. Leaves 10×5 cm, elliptic, acute at both ends. Raceme axillary, shorter than leaf. Sepals 4, ovate, acute; petals 4, narrowed at base, white. Anther bearded; connective not produced. Ovary villous, 2-locular; ovules 2. Drupe oblong, 2-2.3 cm long. Pyrene 2-locular.

India including Tropical Himalayas. Common in wet-deciduous and semi-evergreen forests in Ghats. All seasons. *CJS* 15248, 16790.

Note: *HFP* 2203, from lower Shiradi Ghat keys to this species. However, it differs from *E. serratus* by its racemes which are longer than the leaves.

Elaeocarpus tectorius (Lour.) Poiret in Lam., Encycl. Suppl. 2: 704. 1812; Merrill, Trans. Amer. Philos. Soc. 42: 256. 1935. *Craspedum tectorium* Lour., Fl. Cochinch. 336. 1790. *Elaeocarpus oblongus* sensu J. E. Smith in Rees, Cyclop. 12: n. 2. 1809, non Gaertner. 1788; Gamble, Fl. Madras 124 (88). 1915. *Elaeocarpus robustus* Roxb., [Hort. Beng. 42. 1814, *nom.*] Fl. Ind. 2: 597. 1832; Corner, Gard. Bull. Straits Settlem. 10: 325. 1939.

Trees. Leaves to 16×7.5 cm, broadly elliptic, acute to cuspidate above, acute at base. Sepals 5, ovate, acute, pubescent, glandular, brown; petals 5, narrowed at base, ciliate along margin, white. Anther not bearded. Ovary 2-locular; ovules 2. Drupe elliptic. Pyrene 2-locular.

Indomalaysia. Common in wet-deciduous and semi-evergreen forests in Ghats. January-August. *CJS* 12555, 13721.

Note: The above nomenclature follows from the observations reported by Merrill, (*J. Arnold Arbor.* 32: 194. 1951) in his discussion of *E. serratus.* There are two elements involved in Loureiro's protologue of which the only one identifiable (type extant) belongs to this taxon. Corner (*l.c.*) considered Loureiro's taxon as confused and ignored the existence of Loureiro's type.

Elaeocarpus tuberculatus Roxb., [Hort. Beng. 93. 1814, *nom.*] Fl. Ind. 2:594. 1832; Bedd., Fl. Sylv. t. 113. 1871; Gamble, Fl. Madras 124(88). 1915.

Large trees. Leaves to 26×14 cm, obovate, broad, rounded and obtuse at apex, narrowed and rounded at base; petiole and midrib usually rufous-hairy. Sepals 5, lanceolate, acute, hairy; petals 5, narrowed at base, laciniate at the widening apex, white. Anther aristate. Drupe oblong, 2.5×2 cm, smooth. Pyrene hard, 1-2-locular.

Indomalaysia. Common. An attractive tree in semi-evergreen forests in Ghats. January-May. *CJS* 13330, *HFP* 2638.

36. TILIACEAE

T. P. Ramamoorthy

Annual or perennial, often stellately hairy, mucilaginous herbs, shrubs or trees. Leaves usually alternate; stipules free, early deciduous; blade simple, entire, sometimes lobed, crenate-serrate, mostly palmately veined. Inflorescence axillary, extra-axillary or terminal, of cymes, umbels, racemes, panicles or fascicles, rarely of solitary flowers, bracteate. Flowers mostly bisexual, regular. Sepals usually 5, free, sometimes connate, valvate, accrescent or not; epicalyx occasionally present; petals as many as sepals, imbricate or valvate, often with a basal gland beneath; receptacle often raised into a gynandrophore. Disc usually present. Stamens 10-many, free; anther cells 2, dehiscing longitudinally or poricidally. Ovary superior, 1-10-locular; ovules 2-many, axile; style single, divided or 0; stigma entire or lobed. Fruit capsular or drupaceous.

1 Fruit echinate or bristly.....**Triumfetta**
1 Fruit not echinate, nor bristly.
2 Petals eglandular at base; fruit capsular, elongate.....**Corchorus**
2 Petals glandular at base; fruit drupaceous, often 2-4-lobed.....**Grewia**

CORCHORUS Linnaeus

Usually suffrutescent herbs. Leaves crenate-serrate. Inflorescence of usually leaf-opposed fascicles or cymes, few-many-flowered, sometimes solitary. Sepals 5, free; petals 5, usually yellow. Stamens 15-many. Ovary 2-5-locular; stigmas capitate. Fruit a capsule, angled or ribbed, smooth or muricate. Seeds many, smooth, 4-angled, truncate at both ends.

1 Capsule ending in 3 radiating points.....*C. aestuans*
1 Capsule ending in one point.
2 Capsule pubescent; less than 0.5 cm long.....*C. urticifolius*
2 Capsule glabrous; more than 2 cm long.....*C. trilocularis*

Corchorus aestuans L., Syst. Nat. ed. 10, 1079. 1759; Sant., Fl. Khandala ed. 3: 27. 1967. *Corchorus acutangulus* Lam., Encycl. 2: 104. 1786; Gamble, Fl. Madras 121(86). 1915.

Leaves to 5×1.5 cm, crenate-serrate, acute to rounded at tip, subcordate at base. Sepals lanceolate; petals obovate. Stamens 15. Ovary 3-locular. Capsule 6-angled.

Pantropics. Occasional. Collected once along Channarayapatna-Holenarsipur road, in open country. February. *CJS* 16296.

Corchorus trilocularis L., Mant. 77. 1767; Gamble, Fl. Madras 122(87). 1915.

Fig. 28. TILIACEAE. *A. Triumfetta pilosa*: flowering twig; *Aa*, flower; *Ab*, fruit. *B. Grewia umbellifera*: fruit. *C. Grewia tiliifolia*: flowering node; *Ca*, flower; *Cb*, fruit. *D. Corchorus trilocularis*: flower; *Da*, vertical section through androecium and gynoecium; *Db*, fruit.

Leaves to 5×1.5 cm, elliptic to ovate to lanceolate, obtuse at both ends, sometimes subcordate at base. Sepals lanceolate; petals obovate, hairy at base. Stamens 15-20. Capsule muricate, to 5 cm long, 3-5-angled.

Tropical India. Common in plains in open country, often a weed. September-March. *CJS* 11948, 13564.

Corchorus urticifolius Wight & Arn., Prodr. 73. 1834 ('*urticaefolius*'); Gamble, Fl. Madras 122(87). 1915.

Leaves to 4×1.5 cm, orbicular, acute at tip, subcordate at base, crenate-serrate. Sepals lanceolate; petals obovate. Stamens 15. Capsule ending in a single point, subrounded at tip, pubescent, less than 0.5 cm long.

Tropical Africa through Afghanistan to Western Peninsular India. Occasional on plains in open country, often a weed. November-December. *CJS* 11370, 11953.

GREWIA Linnaeus

Stellately pubescent shrubs or trees, sometimes climbing or straggling. Leaves alternate; stipules free or connate; blade entire, lobed or crenate-serrate. Inflorescence axillary, leaf-opposed or terminal, of cymes, panicles, rarely of solitary flowers. Sepals free, densely pubescent externally; petals entire, sometimes lobed at tip, glandular in lower half. Stamens many, free, borne on short or elongated torus. Ovary 2-locular or 4-locular; ovules 2-many in each; stigma 2-5-lobed. Fruit drupaceous with 1-4 pyrenes.

Note: A genus badly in need of revision.

1 Leaves 4-5-ribbed.
 2 Peduncle shorter than pedicels and petioles.....*G. orientalis*
 2 Peduncle equal to or longer than pedicels, longer or shorter than petioles.
  3 Peduncles shorter than petioles; leaves glabrous with age; flower yellow.....*G. tiliifolia*
  3 Peduncles longer than petioles; leaves pubescent.
   4 Leaves 5-ribbed, glaucous, orbicular, oblique below; flower orange.....*G. orbiculata*
   4 Leaves 4-5-ribbed, ovate, equal at base; flower white.....*G. hirsuta*
1 Leaves 3-ribbed.
 5 Inflorescence terminal, panicles.....*G. microcos*
 5 Inflorescence axillary, rarely terminal, cymes.
  6 Peduncle longer than pedicels.
   7 Leaves glabrous beneath.....*G. umbellifera*
   7 Leaves harshly stellately hairy.....*G. lawsoniana*
  6 Peduncle as long as or shorter than pedicels.
   8 Fruit covered with matted tomentum.....*G. obtusa*
   8 Fruit glabrous or scabrous.
    9 Peduncle shorter than petioles; flowers yellow.....*G. flavescens*
    9 Peduncle longer than petioles; flowers white.
     10 Leaves glabrous; peduncle more than twice as long as petioles.....*G. disperma*
     10 Leaves hairy; peduncle longer than petioles.....*G. hirsuta*

Grewia disperma Rottler ex Sprengel, Syst. 2: 579. 1825; Gamble, Fl. Madras 118(84). 1915.

Trees reaching 4-5 m. Petiole to 1 cm; leaf blade to 14×4 cm, lanceolate, acute to acuminate at tip, narrowed below, serrate, 3-ribbed. Cymes axillary; peduncle 1.5-2.5 cm long; pedicels as long as or slightly longer than peduncles. Sepals lanceolate; pubescent externally; petals acute, greenish-white. Drupe 2-lobed, hairy, glabrous with age, drying black; pyrenes 2, each 2-seeded.

Tropical Africa, India, Burma. Common in western plains and Ghats, along roadsides and outskirts of deciduous to semi-evergreen forests. August-January. *CJS* 13411, *HFP* 2464.

Grewia flavescens A. Juss., Ann. Mus. Natl. Hist. Nat. 4: 91. 1804; Gamble, Fl. Madras 119(85). 1915.

Trees reaching 4-5 m. Petiole 0.5-0.7 cm long; leaf blade to 7.5×3 cm long, oblong, acute at tip, cordate below, serrate, glaucous, stellate hairy beneath, harshly stellate hairy above, 3-ribbed. Buds oblong; peduncle short, 0.3-0.4 cm long; pedicels to 0.7 cm long. Sepals linear-lanceolate, densely stellate hairy externally; petals yellow, spatulate. Fruit usually entire, sometimes slightly lobed.

Tropical Africa, Western Peninsular India. Occasional in hills on plains, in dry deciduous forests at Nagpuri. June. *HFP* 2819.

Grewia hirsuta Vahl, Symb. 1: 34. 1790; Wight, Ic. t. 76. 1838; Gamble, Fl. Madras 119(85). 1915.

Large shrubs to 3-4 m. Petiole to 0.4 cm; leaf blade 4-6.4×2-3.5 cm, ovate, acute to acuminate, cordate at base, serrate, glaucous hairy beneath, 4-5-ribbed. Cymes axillary; peduncle to 1 cm long. Buds globose, pedicels to 0.5 cm long. Sepals elliptic, acute at both ends, densely hairy externally; petals white, shorter. Drupe entire.

Western Peninsular India, Sri Lanka. Fairly common in deciduous forests in plains. July-August. *CJS* 13993, 14122.

Note: CJS 13909 from Bourdalboore State Forest comes closest to *G. hirsuta* except that it has shorter peduncles.

Grewia lawsoniana J. R. Drumm. ex Gamble, Fl. Madras 117(84). 1915.

Usually climbing shrubs, sometimes erect. Petiole to 1.2 cm long; leaf blade to 11×5.5 cm, elliptic, acute at tip, cordate at base, sparsely harshly hairy beneath, serrate, 3-ribbed. Cymes axillary; peduncle to 4.5 cm long. Buds oblong, acute; pedicel 1-2 cm long. Sepals linear-lanceolate, densely hairy without; petals shorter, elliptic, acute, white. Drupe 4-lobed, turning black, sparsely stellately hairy when mature.

Western Peninsular India. Common in upper Ghats, in partial shade, along outskirts of wet-deciduous to semi-evergreen forests, sometimes

climbing over large trees. Throughout the year. *CJS* 11695, 16594.

Note: It is possible that this taxon is the same as *G. gamblei.*

Grewia microcos L., Syst. Nat. ed. 12, 602. 1766; Gamble, Fl. Madras 116(83). 1915. *Microcos tomentosa* J. E. Sm. in Rees, Cyclop. 23: n. 2. 1813; Backer & Bakh. f., Fl. Java 1: 393. 1963. *Grewia ulmifolia* Roxb., Fl. Ind. 2: 591. 1832; Wight, Ic. t. 84. 1838.

Shrubs reaching 4-5 m. Petiole less than 0.8 cm long; leaf blade to 15×5 cm, ovate-lanceolate, acute, subentire, palmately 3-ribbed, glabrous. Panicle terminal; buds globose; sepals elliptic, acute, pubescent without; petals shorter, white. Fruit entire.

Asia. Occasional in Shiradi Ghat, along edges of semi-evergreen forests. April. *CJS* 9685, 9686.

Grewia obtusa Wall. ex Gamble, Fl. Madras 117(83). 1915. *Grewia bracteata* sensu Wight & Arn., Prod. 76. 1834, non Roth, 1821.

Arborescent shrubs or small trees. Petiole to 0.5 cm long; leaf blade to 6.5×4 cm, rounded to elliptic, acute to rounded at tip, subcordate at base, 3-ribbed. Cyme axillary; peduncle 0.5-0.6 cm, pubescent. Bud ovate; pedicel to 1 cm. Sepals broadly ovate, acute; petals white. Fruit entire, covered with matted hairs.

Western Peninsular India. Occasional in scrub at Belvathally State Forest. May-August. *CJS* 13542, 14405.

Grewia orientalis L., Sp. Pl. ed. 2, 964. 1762; Gamble, Fl. Madras 117(84). 1915. *Grewia columnaris* J. E. Sm. in Rees, Cyclop. 17: n. 5. 1811; Wight, Ic. t. 44. 1838.

Shrubs. Petiole to 0.7 cm long; leaf blade to 3.5×2.5 cm, orbicular, subcordate at base, serrate, glabrescent with age, 3-ribbed. Cymes axillary, 1-3-flowered; peduncle to 0.5 cm, bud globose; pedicel to 0.8 cm long. Sepals oblong, acute, hairy externally; petals ovate-lanceolate, white. Fruit 2-4-lobed, hairy, glabrous with age.

East Tropical Africa, S. W. & E. India, Sri Lanka, Java. Locally common at Belvathally in scrub forests in eastern plains. September. *CJS* 17860.

Grewia orbiculata Rottler, Ges. Naturf. Freunde Berlin Neue Schriften 4: 205. 1803. *Grewia rotundifolia* A. Juss., Ann. Mus. Natl. Hist. Nat. 4: 92, t. 50. 1804; Wight, Ic. t. 45. 1838; Gamble, Fl. Madras 118(84). 1915.

Small trees reaching 4-5 m in height. Petiole to 0.5 cm, short, hairy; leaf blade to 6×4.5 cm, orbicular, cordate and oblique at base, glaucous-hairy, 5-ribbed. Cyme axillary, few-flowered. Peduncle 1.5-2 cm long; buds globose; pedicel to 1 cm long. Sepals lanceolate, hairy externally; petals orange red. Fruit slightly lobed, globose, glaucous-tomentose.

Western Peninsular India. Common in hills in eastern plains. April-July. *CJS* 14392, *HFP* 152.

Grewia tiliifolia Vahl, Symb. 1: 35. 1790; Bedd., Fl. Sylv. t. 108. 1871; Gamble, Fl. Madras 118(84). 1915 (*'tiliaefolia'*).

Trees reaching 6-8 m high. Petiole 1.5-3 cm long; leaf blade to 14×10 cm, orbicular, acute, cordate and oblique at base, serrate, 5-ribbed, pubescent, glabrous with age. Cymes clustered, usually 3-flowered; peduncle to 1 cm. Buds globose; pedicel to 1 cm long. Sepals lanceolate, acute, hairy externally; petals yellow. Drupe globose, entire, glabrous with age, turning black.

Tropical Africa, Tropical India, Burma. Common in dry deciduous to semi-evergreen forests in plains and Ghats. March-August. *CJS* 13249, 14135, 16698, *HFP* 1743.

Grewia umbellifera Bedd., For. Man. Bot. 37. 1871; Gamble, Fl. Madras 117(84). 1915.

Trees reaching 4-5 m high. Petiole to 1 cm; leaf blade to 14×7.5 cm, elliptic, acute, rounded to subcordate at base, 3-ribbed, subentire. Umbel few-flowered; peduncle to 2.5 cm long. Buds oblong; pedicels to 1.2 cm long. Sepals linear-lanceolate, acute, pubescent externally; petals white. Fruit deeply 4-lobed, turning black and glabrous with age.

Central & Peninsular India. Common on Shiradi Ghat, along outskirts of wet deciduous to semi-evergreen forests. February-October. *CJS* 14228, *HFP* 1464.

TRIUMFETTA Linnaeus

Annual or perennial herbs or undershrubs. Leaves simple, entire, sometimes 3-4-lobed, crenate-serrate. Inflorescence leaf-opposed or axillary, of clusters, cymes, sometimes in terminal racemes. Sepals 5, free; petals 5, glandular below. Stamens 10-25. Ovary 1-3-locular; style simple; stigma capitate. Capsule globose, covered by setae or tubercles.

1 Flower 1 cm or more across; capsule 2.5 cm across ..... *T. pilosa*
1 Flower 0.6 cm or less; capsule less than 1 cm across.
2 Inflorescence of terminal racemes; bristles of fruits puberulous ..... *T. rotundifolia*
2 Inflorescence of axillary clusters; bristles of fruits glabrous ..... *T. rhomboidea*

Triumfetta pilosa Roth, Nov. Pl. Sp. 223. 1821; Gamble, Fl. Madras 120(86). 1915.

Undershrubs reaching 2-2.5 m; stem pilose. Leaf blade to 14×6 cm, ovate-lanceolate, acute to acuminate, cordate to subcordate at base, with many bulbous-based hairs. Sepals lanceolate, with the midrib produced into a claw at tip, stellately hairy; petals shorter, clawed below.

Disc pilose. Stamens 10. Ovary 3-locular. Fruit 2.5 cm across, the body tomentose, the bristles hooked and ciliate.

Tropical Africa, India. Common in Ghats, usually in shade along ghat roads, outskirts of wet-deciduous to semi-evergreen forests. September-December. *CJS* 11516, *HFP* 2162.

Triumfetta rhomboidea N. Jacq., Enum. Pl. Carib. 22. 1760; Gamble, Fl. Madras 120(86). 1915. *Bartramia indica* L., Sp. Pl. 378. 1753 [non *Triumfetta indica* Lam., 1792]. *Triumfetta bartramia* L., Syst. Nat. ed. 10, 2: 1044. 1759, *nom. illegit.*

Woody herbs reaching 1-1.5 m high. Leaves to 6×5 cm, ovate, acute, often 3-lobed, with bulbous-based hairs. Sepals corniculate at tip; petals clawed below. Disc pilose. Stamens 10. Ovary 2-locular. Fruit body tomentose; bristles glabrous and hooked.

Tropical Africa, Asia. Common in plains and Ghats, oftena long roads and as a weed in estates. October-December. *CJS* 10001, 10002, 12129.

Triumfetta rotundifolia Lam., Encycl. 3: 421. 1792; Gamble, Fl. Madras 120(86). 1915.

Fruticose herbs reaching 1 m. Leaves to 2.5×2.5 cm, orbicular, crenate-serrate, densely grey tomentose beneath; petals clawed. Stamens 20. Ovary 1-locular. Fruit body tomentose; bristles hooked and pubescent.

Central & Peninsular India, Burma. Collected once on outskirts of Arsikere town. December. *CJS* 11961.

37. STERCULIACEAE

T. P. Ramamoorthy

Annual or perennial, unarmed herbs, shrubs or trees. Leaves alternate; petiole pulvinate; stipules usually deciduous; blade simple, digitate or lobed, entire, crenate or serrate, palmately veined. Inflorescence of solitary flowers, cymes, racemes, panicles, clusters or heads, axillary or extra-axillary, occasionally cauliflorus. Flowers bisexual or unisexual, usually regular; bract and bracteoles present. Sepals connate, rarely free, usually 5-lobed, valvate. Petals 0 or 5, free, equal or unequal, often clawed. Stamens 5-many, the fertile often alternating with staminodes; filaments free in phalanges or monadelphous; anthers 2-celled, often clustered, sessile or stalked. Pistils 1-5, rarely to 12, free to variously united, superior, sometimes on a stalk (gynophore); ovules 2-many in each carpel, on inner margin; styles terminal, sometimes eccentric, 1-6, free or connate; stigma rarely lobed. Fruit a loculicidal or septicidal capsule or of spreading or twisted, membranous or woody follicles, rarely drupaceous; seeds sometimes arillate, occasionally winged.

1 Herbs.
2 Petals clawed.
3 Petals bearing a narrow slender appendage.....**Byttneria**
3 Petals without appendage.....**Waltheria**
2 Petals not clawed.
4 Calyx tube deeply 5-partite.....**Melhania**
4 Calyx tube nearly truncate with 5-teeth.....**Melochia**
1 Shrubs or trees.
5 Petals present.
6 Leaves entire; petals similar, not clawed.....**Pterospermum**
6 Leaves crenate-serrate; petals dissimilar, clawed.....**Helicteres**
5 Petals absent.
7 Leaves with peltate scales below; pistils alternating with staminodes; follicles keeled on back.....**Heritiera**
7 Leaves without peltate scales; pistils not alternating with staminodes; follicles not keeled on back.
8 Follicles membranous; inflorescence covered with orange-red tomentum.....**Firmiana**
8 Follicles woody; inflorescence not covered with orange-red tomentum....**Sterculia**

BYTTNERIA Loefling *nom. cons.*

Creeping fruticose herbs with ascending branches. Leaves sub-opposite, crenate-serrate, with narrow stipules. Inflorescence cymose, axillary. Flowers bisexual, regular, bracteolate. Sepals 5, shortly connate below. Petals 5, free, adnate to staminal tube, clawed, produced into an elongate, strap-shaped limb. Stamens 5, alternating with 5 staminodes, all fused at base into a column. Ovary 5-locular; style simple; stigma capitate. Capsule septicidally 5-valved, globose-ovoid, covered with short prickles. Seeds 5, grey.

Byttneria herbacea Roxb., Pl. Cor. t. 29. 1795; Gamble, Fl. Madras 112(80). 1915.

Leaves to 2.2×1.5 cm, ovate, acuminate, cordate at base, usually with a linear gland at base on lower side of midrib, glabrescent; stipules linear. Flower maroon with yellow anthers.

Central & S. India. Rare; found once on dry sandy-rocky terrain at Bourdalboore State Forest (in the eastern plain). August. *HFP* 488.

FIRMIANA Marsili

Deciduous trees. Leaves alternate, lobed, with lanceolate stipules. Inflorescence of racemes or panicles on old wood, usually covered with orange-red tomentum. Flowers unisexual, regular. Calyx tubular, 5-toothed, colored. Petals 0. Stamens 5-15; anthers sessile, crowded, borne at tip of an elongate gynandrophore; pistillodes 5, free, hidden by

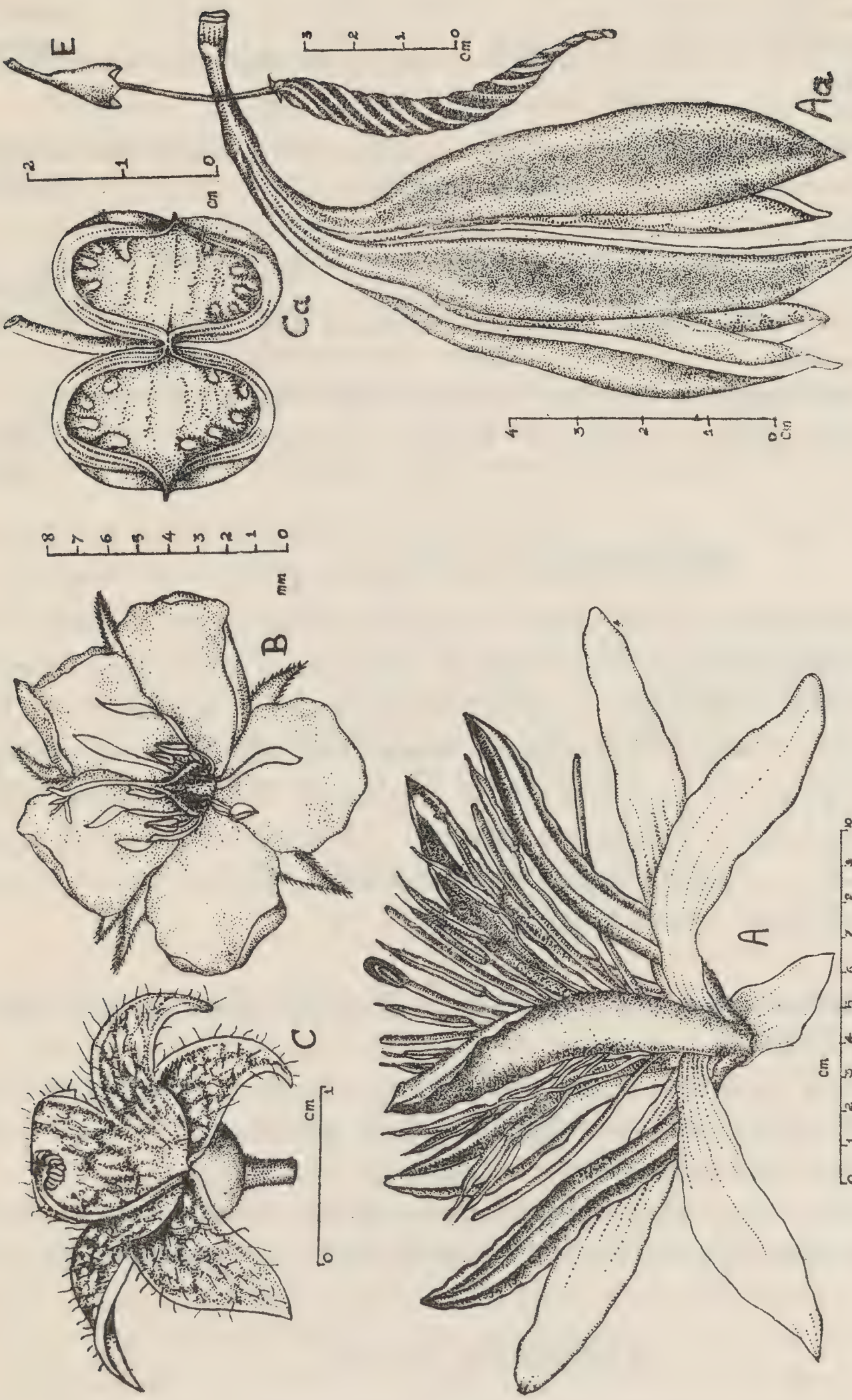


Fig. 29. STERCULIACEAE. *A. Pterospermum acerifolium:* flower; *Aa,* fruit. *B. Melhania incana:* flower. *C. Sterculia guttata:* staminate flower; *Ca,* fruit.

anthers, embedded at tip of gynandrophore. Pistils 5, free, each 2-locular, with 2 ovules per locule; style short, somewhat eccentric. Fruit of 5, free, stalked, membranous, prematurely dehiscing follicles, 1-few-seeded.

Firmiana colorata (Roxb.) R. Br. in Bennet & Brown, Pl. Jav. Rar. 235. 1844; Gamble, Fl. Madras 107(76). 1915; Kostermans, Reinwardtia 5: 386. 1961. *Sterculia colorata* Roxb., Pl. Cor. t. 25. 1795.

Medium trees with palmately 3-lobed, pilose leaves. The panicle bright red. Calyx to 2 cm long, with 5 triangular acute teeth, with scarlet red, stellate tomentum on the outside; the inside bearded at base or stellately hairy. Gynandrophore long-exserted, black: anthers yellow.

North East India, including Burma, South W. India, Sri Lanka. Occasional, a few trees are found on top of hills in eastern plains, near Nagpuri. January-March. *CJS* 16624, *HFP* 1276.

HELICTERES Linnaeus

Unarmed, erect or scandent shrubs or small trees. Leaves alternate, serrate-dentate. Inflorescence of fascicles, umbeis, sometimes a solitary flower, pedunculate, axillary. Flowers pedicelled, bisexual. Calyx spathaceous, tubular, 3-5-toothed, somewhat oblique at mouth, circumscissile at base after anthesis, withering and remaining like a tube at base of gynandrophore. Petals 5, free, unequal, usually glandular on the inside, clawed; posterior 2 petals larger, winged towards tip; other 3 narrow, auricled at tip. Receptacle produced into an elongate gynandrophore. Stamens 10, on a short staminal tube, terminating the gynandrophore, hiding the 5, inwardly placed staminodes; filaments short. Pistils 5, each many-ovuled; styles 5, stigmatose at tip. Fruit of 5, often spirally twisted, many-seeded follicles.

Helicteres isora L., Sp. Pl. 963. 1753; Wight, Ic. t. 180. 1839; Gamble, Fl. Madras 107(77). 1915.

Arborescent shrubs, stellately tomentose. Leaves to 11 × 8 cm, oblong-obovate, shallowly cordate and unequal, acute-acuminate at tip, crenate-serrate, 3-5-ribbed from base. Flower to 5 cm long. Calyx brown-tomentose; petals reflexing, glandular on the inside, red fading to grey. Fruit greyish; follicles spirally twisted, 5-7 cm.

Indomalaysia. Common along roadsides, in semi-evergreen forests in Ghats. October-February. *CJS* 15861, 16010, *HFP* 808.

HERITIERA Dryander ex Aiton

Unarmed trees. Leaves alternate. Inflorescence of panicles, axillary and extra-axillary. Flowers small, bisexual or unisexual, pedicelled,

regular. Calyx tubular, 5-toothed. Petals 0. Receptacle produced into short to long gynandrophore. Stamens 5-10, at tip of a staminal column; anthers sessile, crowded, surrounding the reduced pistillodes. Pistils 5, free, alternating with a pair of staminodes at base, each 1-locular, 1-2-ovuled; styles short, recurving; stigmas thick. Follicles free, winged or not, 1-seeded, indehiscent.

Heritiera papilio Bedd., Fl. Sylv. t. 218. 1872; Gamble, Fl. Madras 104(74). 1915; Kostermans, Reinwardtia 4: 511. 1959 & 5: 382. 1961.

Leaves entire covered by golden-brown scales when young, glabrescent when mature and closely set with small white scales on lower surface. Inflorescence covered by golden-brown hairs. Flowers unisexual. Stamens 5. Carpels developing into red follicles prominently winged on one side.

South W. India. Occasional in semi-evergreen forests in lower Bisle Ghat. January-February. *CJS* 16026, 16252.

MELHANIA Forskal

Branching suffruticose herbs. Leaves alternate, crenate-serrate, with filiform stipules. Inflorescence racemose, cymose, binate or sometimes solitary, pedunculate, axillary. Flowers bisexual, regular; bracteoles 3, forming an epicalyx. Calyx deeply 5-partite. Petals 5, free, semipersistent, not clawed. Receptacle flat. Fertile stamens 5, alternating with 5 staminodes, all united below into a short cup; staminodes spatulate. Pistils 5, free, each 1-locular, 1-many-ovuled. Seeds tuberculate.

Melhania incana Heyne ex Wight & Arn., Prodr. 68. 1834; Gamble, Fl. Madras 113(81). 1915.

Leaves to 2.2×0.7 cm, crenate-serrate, elliptic, grey-pilose below, glabrescent above. Inflorescence of cymes. Calyx lobes lanceolate, acute, hairy. Petals yellow, orbicular. Capsule globose-ovoid, hairy.

South W. India. Locally common at Nagpuri on dry sandy soil. June. *HFP* 2832.

MELOCHIA Linnaeus

Trees, shrubs or herbs. Leaves alternate with erect, lanceolate stipules, serrate. Inflorescence cymes, heads or fascicles, sometimes collected into corymbs or panicles, axillary or terminal. Flowers bisexual, regular. Calyx tube toothed or deeply partite. Petals 5, free, spatulate, not clawed. Receptacle flat. Stamens 5; filaments connate in a tube; staminodes 0.

Ovary densely hairy or pubescent, 5-locular; locules 1-2-ovulate; styles 5, connate at base. Capsule 5-valved; loculicidal, each 1-2-seeded.

Melochia corchorifolia L., Sp. Pl. 675. 1753; Gamble, Fl. Madras 110(79). 1915.

Herbs. Leaves to 6×2.5 cm, ovate, acuminate, cordate at base, crenate-serrate, 5-ribbed from base. Bracts ciliate; bracteoles linear. Calyx tubular, truncate, 5-toothed. Petals spatulate, pink. Capsule 5-valved, smooth.

Tropics. Occasional, along roadsides in plains. September-October. *CJS* 9236, 11231.

PTEROSPERMUM Schreber *nom. cons.*

Inermous, stellately pubescent or scaly, erect shrubs or trees. Leaves alternate; stipules entire to laciniate; blade entire or lobed. Inflorescence of fascicles, cymes, short racemes, sometimes solitary flowers, axillary, rarely terminal. Flowers large, elongate, bisexual. Calyx shortly connate at base, fleshy. Petals 5, membranous, free. Receptacle elongated into a gynandrophore. Staminal column adnate to gynandrophore. Stamens 15, in 5 fascicles of 3 each; each fascicle alternating with a subulate staminode; connectives slightly produced. Ovary 5-locular, each many-ovuled; style entire, slender; stigma globose, somewhat furrowed. Capsule woody, terete or angled, usually septicidally 5-valved, enclosing many, flat, winged seeds.

Pterospermum acerifolium Willd., Sp. Pl. 3: 729. 1801; Masters in J. Hooker, Fl. Brit. India 1: 368. 1874.

Trees. Leaves entire, to 18×11 cm, oblong-obovate, cordate at base, shortly acute at apex, 3-5-plinerved, rusty-tomentose below. Flowers fascicled, solitary, 7-15 cm long. Calyx brown on the outside. Petals thin, white, glabrous inside, stellate hairy outside.

Indomalaysia. Frequent but not abundant in semi-evergreen forests in Ghats. September-May. *CJS* 15597, *HFP* 1815.

Note: Backer & Bakh. f. (*Fl. Java* 1: 409. 1963) indicate the close affinity of this tree to *P. diversifolium* Blume which has entire or bifid but not pectinate stipules. We are grateful to Prof. Kostermans for the determination of our specimens.

STERCULIA Linnaeus

Unarmed, deciduous trees. Leaves alternate, usually crowded towards apices of stem, entire or digitately lobed; stipules caducous. Inflorescence of racemes or panicles, axillary or terminal. Flowers usually unisexual. Calyx tube 5-toothed; petals 0. Receptacle produced into an elongate gynandrophore. Stamens 5-15; anthers sessile, crowded

together at tip of gynandrophore, surrounding reduced pistillodes; staminodes 0. Pistils 3-6 (sometimes slightly cohering), stalked, each 1-locular, 2-many-ovuled. Follicles woody, stalked, with many, usually arillate, smooth seeds.

1 Leaves entire; follicles not bristly.....*S. guttata*
1 Leaves 3-5-lobed; follicles bristly.....*S. urens*

Sterculia guttata Roxb., Hort. Beng. 50. 1814; DC., Prodr. 1: 482. 1824; Wight, Ic. t. 487. 1841; Bedd., Fl. Sylv. t. 105. 1871; Robinson, Philipp. J. Sci. 7: 414. 1912; Gamble, Fl. Madras 106(76). 1915.

Leaves to 13×7 cm, entire, ovate, acuminate, cordate at base; glabrescent above, rusty, stellately pubescent on nerves below. Flower reddish. Calyx lobes ovate, acute, densely hairy, reflexed. Stamens 12. Carpels 3-5. Follicles large, pubescent, turning bright red, enclosing many black, smooth seeds. Funicles bristly.

South W. India, Sri Lanka. Common large trees in wet deciduous to semi-evergreen forests in Ghats. September-April. *HFP* 918, 2753.

Sterculia urens Roxb., Pl. Cor. t. 24. 1795; Gamble, Fl. Madras 106(79). 1915.

Bark peeling. Leaves to 20×20 cm, orbicular, digitately 3-5-lobed, glaucous below. Calyx hairy; lobes not reflexed, short. Stamens 15. Carpels 5. Follicles acute at both ends, bristly-hairy.

Throughout India, Sri Lanka. Local in distribution. Common in dry deciduous forest towards Nagpuri in hills of eastern plains. October-March. *CJS* 16063, *HFP* 1270.

WALTHERIA Linnaeus

Herbs or undershrubs, usually stellately pubescent. Leaves alternate, crenate-serrate, with narrow stipules. Inflorescence of fascicles, axillary or terminal, bracteate. Flowers bisexual, regular. Calyx deeply 5-partite; petals 5, clawed; receptacle flat. Stamens 5; filaments fused at base forming a short column; staminodes 0. Ovary 1-locular, 2-ovuled; style eccentric; stigma penicillate. Fruit a 2-valved, 1-seeded capsule.

Waltheria americana L., Sp. Pl. 673. 1753; Backer & Bakh. f., Fl. Java 1: 406. 1963. *Waltheria indica* L., Sp. Pl. 673. 1753; Gamble, Fl. Madras 106(79). 1915; Adams, Fl. Pl. Jamaica 483. 1972.

Fruticose, branching herbs. Leaves 5×3.5 cm, crenate-serrate, ovate, cordate at base, rounded at tip. Calyx tube long. Petals spatulate, long-clawed.

Tropics. Common, often a weed. December. *CJS* 10278, 12006.

Note: *Waltheria americana* L. is the lectotype species of the genus.

38. BOMBACACEAE

D. H. Nicolson & C. J. Saldanha

SALMALIA Schott & Endlicher

Deciduous trees, often armed with prickles. Leaves alternate; stipules small, deciduous; blade palmately compound; leaflets entire, pinnately veined. Inflorescence of fascicles or solitary flowers, usually on leafless branches. Calyx campanulate, irregularly lobed, persistent; petals usually 5, free, adnate to staminal tube. Stamens many, connate, branching into 5-6 fascicles (phalanges); anthers 1-2-celled. Ovary 5-locular; ovules many in each locule, axile; style 5-branched. Capsule woody, 5-valved; seeds many, covered by cottony hairs.

1 Flower 5-7 cm, dark red; stamens less than 80; capsule hairy.....*S. malabarica*

1 Flower 10-14 cm, light red; stamens more than 400; capsule glabrous.....*S. insignis*

Salmalia malabarica (DC.) Schott & Endlicher, Melet. Bot. 35. 1832. *Bombax malabaricum* DC., Prodr. 1: 479. 1824; Bedd., Fl. Sylv. t. 82. 1871; Gamble, Fl. Madras 99(71). 1915. *Bombax ceiba* auct., non L., 1753: Robyns, Taxon 10: 157. 1961 & Bull. Jard. Bot. Bruxelles 33: 1-315. 1963.

Trees to 15-20 m. Petiole 12-16 cm, pulvinate; leaflets 5-7, petiolulate, 8-16 × 3-7 cm, elliptic, acute at tip, narrowed below, entire, chartaceous. Flowers showy, dark red. Calyx woolly within; petals oblong, acute, hairy externally. Capsule velvety.

Indomalaysia. Fairly common in western plains and upper Ghats in deciduous forests and along roads. Flowers in February. *CJS* 16362, *HFP* 2741.

Note: The cotton surrounding the seeds is commonly used for stuffing pillows and mattresses. The wood is used for matchsticks.

Andre Robyns (*ll. cc.*) concluded that *Bombax ceiba* L., the type of the genus *Bombax*, must be typified on Moul-elavou (Rheede, *Hort. Malab.* 3: t. 52. 1682), an Asiatic species. There is a tendency for recent workers to accept Robyns' lead. There are several confusing elements to this problem, but the central problem is typifying *Bombax ceiba* L. from mixed materials cited by Linnaeus, of two genera: one New World (with many stamens and deciduous calyx) and one Old World (with many stamens and persistent calyx). Robyns admits that Linnaeus used an Amerind name, *Ceiba,* (meaning 'canoe') for this taxon, that he referred to Brazilian sources under his reference to Bauhin, and that Linnaeus (*Syst. Nat.* 2: 457. 1767) specifically excluded Rheede ('*excluso Rheede*') from *Bombax ceiba* L. and cited Robyns' lectotype plate under another species, *B. heptaphyllum.*

We cannot accept Robyns' lectotypification of *Bombax ceiba* L. as an Asiatic taxon because Linnaeus (1767) himself excluded the possibility. Because we see *Bombax ceiba* L. as a New World taxon, as Linnaeus came to understand it, this leaves the Old World element without a name. The earliest applicable and available name is *Salmalia*

malabarica (DC.) Schott & Endlicher. If one takes, and we do not, an extremely broad view of *Bombax* so that it includes *Salmalia*, presumably as a subgenus, this taxon could be called *Bombax malabaricum* DC., as did Gamble.

Salmalia insignis (Wall.) Schott & Endlicher, Melet. Bot. 35. 1832.
Bombax insigne Wall., Pl. As. Rar. 1: 71. 1830; Gamble, Fl. Madras 100(71). 1915.

Large trees, branches often prickly. Leaflets 7-9, obovate, cuspidate, glaucous beneath. Flowers light red. Petals hairy externally. Stamens numerous. Capsule glabrous.

W. Peninsular India, Burma, Andamans. Occasional in secondary forests in lower Bisle Ghat. January. *CJS* 16013.

39. MALVACEAE

T. P. Ramamoorthy

Annual or perennial herbs, shrubs or trees, usually stellately tomentose, sometimes covered with scales or prickles. Leaves alternate, stipulate, simple, entire, crenate-serrate, often palmately lobed, sometimes pinnatisect, palmately veined, often glandular on nerves beneath. Inflorescence axillary or terminal, of racemes, spikes, panicles or clusters, sometimes of solitary flowers. Flowers usually bisexual, regular. Calyx 5-parted or 5-toothed, rarely entire, valvate, distinctly veined, persistent, sometimes spathaceously splitting and caducous, often subtended by an epicalyx. Petals 5, valvate or contorted. Stamens 15-many, monadelphous; staminal column adnate to the base of petals, branching at tip or produced into filaments; anthers dorsifixed, 1-celled; pollen grain minutely spinulose. Ovary superior, usually 5-locular; ovules 1-many per locule, axile; styles as many as or twice as many as locules; stigmas as many as styles, sometimes united. Fruit a schizocarp of 1-many-seeded cocci, a capsule or rarely indehiscent. Seeds often reniform, often hairy or woolly.

1 Style solitary..... **Thespesia**
1 Styles many.
2 Trees; flowers polygamous; stamens pentadelphous, each phalange with united anthers ..... **Kydia**
2 Shrubs or herbs; flowers bisexual; stamens usually monadelphous, anthers always free.
3 Antheriferous filaments apical on column.
4 Epicalyx present..... **Malvastrum**
4 Epicalyx absent.
5 Ovules 2-many per locule; cocci 2-many seeded..... **Abutilon**
5 Ovule 1 per locule; cocci 1-seeded..... **Sida**
3 Antheriferous filaments lateral on column.
6 Styles twice the number of carpels.

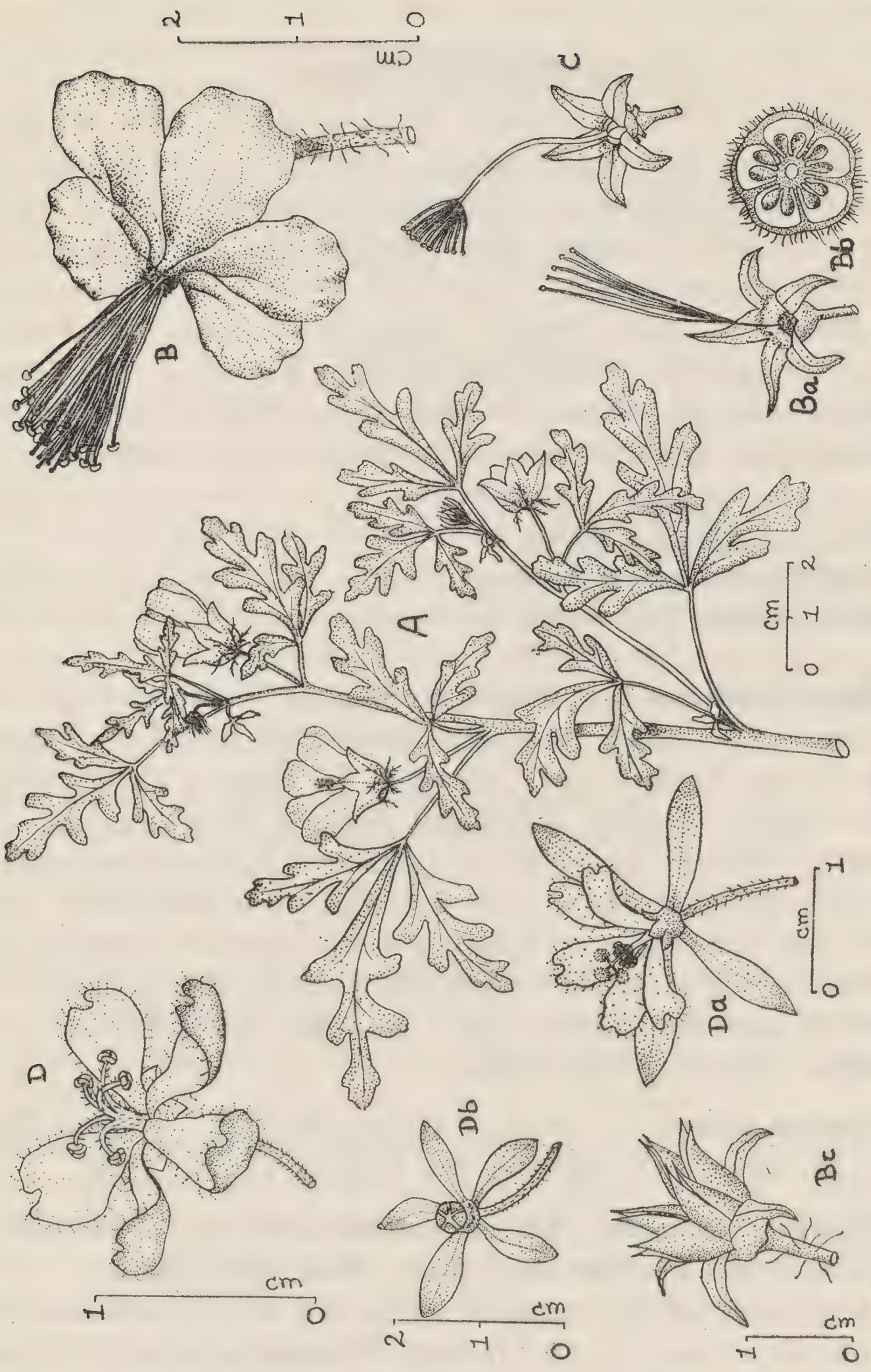


Fig. 30. MALVACEAE. *A. Hibiscus trionum*: portion of plant in flower and fruit. *B. Abutilon persicum*: flower; *Ba*, flower, minus corolla; *Bb*, ovary in section; *Bc*, fruit. *C. Pavonia zeylanica*: gynoecium with calyx. *D. Kydia calycina*: staminate flower; *Da*, pistillate flower; *Db*, fruit.

7 Leaves glandular beneath on midrib.....**Urena**
7 Leaves eglandular on midrib.....**Pavonia**
6 Styles as many as carpels.
8 Calyx spathaceous.....**Abelmoschus**
8 Calyx equally 5-lobed.....**Hibiscus**

ABELMOSCHUS Medicus

Usually stellately hairy or prickly, erect prostrate herbs, shrubs or trees. Leaves palmately lobed or parted, rarely entire; petiole somewhat channeled on one side and hairy. Flowers solitary, axillary or in terminal racemes by reduction of upper leaves, pedicelled. Epicalyx segments 4-16, usually free and persistent. Calyx spathaceous, splitting on one side, 5-toothed, deciduous with corolla. Staminal column not exserted, antheriferous throughout. Ovary sometimes to 9-locular; ovules many; style as many as carpels, connate, branching near tip. Capsule loculicidally dehiscent, with many, reniform, glabrous or hairy seeds.

1 Stem hispid; epicalyx segments 6-16.....*A. moschatus*
1 Stem not hispid; epicalyx segments 4-8.
2 Epicalyx small, linear-lanceolate, deciduous.....*A. ficulneus*
2 Epicalyx segments large, ovate, persistent.....*A. manihot*

Abelmoschus ficulneus (L.) Wight & Arn. ex Wight, Cat. 14. 1833; Wight, Ic. t. 154. 1839; Borssum, Blumea 14: 101. 1966. *Hibiscus ficulneus* L., Sp. Pl. 695. 1753; Gamble, Fl. Madras 97(69). 1915.

Frutescent herbs. Leaves palmately 5-lobed, to 4×4 cm, lobes crenate-serrate. Flowers in terminal racemes. Epicalyx segments 5, linear, subulate, deciduous soon after anthesis; calyx 5-toothed. Petals to 3×1.2 cm, obovate, white. Capsule oblong, apiculate, 5-angled, with many globular, black, glabrous or minutely stellately hairy seeds.

East Africa to Australia. Occasional. In open along roadsides or in untended fields. January. *HFP* 1266.

Abelmoschus manihot (L.) Medic., Malva. 46. 1787. *Hibiscus manihot* L., Sp. Pl. 696. 1753; Gamble, Fl. Madras 97(69). 1915.

ssp. **tetraphyllus** (Hornem.) Borssum, Blumea 14: 97. 1966. *Hibiscus tetraphyllus* Roxb. ex Hornem., Hort. Hafn. 661. 1815.

Large, fruticose, prickly annuals, 2.5-3.5 m. Leaves orbicular, 3-5-lobed, hastate at base, to 12×10 cm. Flowers in terminal racemes. Epicalyx segments ovate-acute, densely white-hairy along margin. Petals large, 8-10 cm, obovate, bright yellow, dark purple toward the base. Capsule densely bristly; seeds smooth.

S. Asia to North Australia. Common along roadsides in wet deciduous to semi-evergreen forests. November-March. *CJS* 11209, 11452, *HFP* 2339.

Abelmoschus moschatus Medic., Malv. 46. 1787; Borssum, Blumea 14: 90. 1966. *Hibiscus abelmoschus* L., Sp. Pl. 696. 1753; Gamble, Fl. Madras 97(69). 1915.

Large fruticose, annual with reflexed, reddish hairs on the stem. Leaves 3-5-lobed, cordate at base. Flowers in terminal racemes. Epicalyx 7-10-lobed, subulate, appressed in fruit. Petals large, bright yellow with dark purple base. Capsule globose, hispid with simple hairs. Seeds globose.

S. Asian to Pacific Islands; elsewhere cultivated. Locally common amongst boulders in scrub or deciduous forests in the hilly tracts of eastern plains, towards Nagpuri. August. *HFP* 1949.

ABUTILON Miller

Annual or perennial herbs, undershrubs, rarely small trees. Leaves entire, sometimes deeply lobed, cordate at base, palmately veined. Flowers solitary, axillary, occasionally panicled by abortion of upper leaves; pedicel articulate above the middle. Epicalyx 0. Calyx campanulate, 5-fid, persistent. Petals 5, free, rotate, rarely fused. Staminal column short, dissolving into numerous filaments. Ovary 5-many-locular, each locule 2-many-ovuled; styles as many as locules, shortly connate at base; stigma capitate. Schizocarp depressed-globose, sometimes cylindrical; cocci as many as carpels, dehiscent, with 2-many, loosely held seeds.

1 Styles and cocci 20-more; leaves orbicular-reniform.....*A. pannosum*
1 Styles and cocci 5-10; leaves ovate-lanceolate, often long-acuminate.
2 Styles and cocci 5.....*A. persicum*
2 Styles and cocci 10.....*A. indicum*

Abutilon indicum (L.) Sweet, Hort. Brit. 54. 1826; Wight, Ic. t. 12. 1838; Gamble, Fl. Madras 91(65). 1915; Borssum, Blumea 14: 170. 1966. *Sida indica* L. in Torner, Cent. II Pl. 26. 1756; Amoen. Acad. 4: 324. 1759.

Annual or perennial, densely tomentose herbs. Leaves ovate, acute at tip, cordate at base, crenate, 2-5 × 2-5 cm, 7-9-nerved. Pedicel longer than petiole. Calyx campanulate, 5-lobed, persistent, slightly accrescent, stellately spreading in fruit. Staminal column stellately hairy below, glabrous above. Cocci 10, longer than calyx, shortly acuminate at tip. Seeds glabrous or sparsely hairy.

Tropics. Common along roadsides, in open country, especially in open scrub jungles in the plains. November-December. *CJS* 11980, 15558.

Abutilon pannosum (Forst. f.) Schlect., Bot. Zeit. 9: 828. 1851. *Sida pannosa* Forst. f., Comm. Phys. Soc. Reg. Goetting 1787: 62. 1789. *Sida glauca* Cav., Ic. 1: 8, t. 11. 1791. *Sida mutica* Delile (1813, *nom.*)

ex DC., Prodr. 1: 470. 1824. *Abutilon glaucum* (Cav.) Sweet, Hort. Brit. 54. 1826; Gamble, Fl. Madras 91(66). 1915. *Abutilon muticum* (DC.) Sweet, Hort. Brit. ed. 2, 65. 1830.

Tomentose herbs. Leaves ovate-reniform, to 4×4 cm, serrate; stipules reflexed. Pedicel as long as the petiole, jointed near tip. Calyx campanulate, 5-lobed, persistent, somewhat accrescent; petals orbicular, 0.5 cm broad, sometimes lobed, yellow. Staminal column glabrous. Cocci 20, not acuminate, silky tomentose, shorter than calyx, depressed above.

North Africa, S. W. Asia & Australia (not Malaysia!). Occasional in plains (Arsikere). June. *CJS* 13748.

Abutilon persicum (N. Burman) Merrill, Philipp. J. Sci. 19: 364. 1921; Borssum, Blumea 14: 163. 1966. *Sida persica* N. Burman, Fl. Ind. 148, t. 47, f. 1. 1768. *Sida polyandra* Roxb., Fl. Ind. 3: 173. 1832. *Abutilon polyandrum* (Roxb.) Wight & Arn., Prodr. 55. 1834, non G. Don, 1831; Gamble, Fl. Madras 91(65). 1915.

Woody herbs to 3-4 m. Leaves ovate, acuminate, cordate at base, crenate, to 20×18 cm, stellately hairy above, appressed glaucous-tomentose beneath. Calyx lobes shorter than cocci; petals orbicular, somewhat narrowed toward base, yellow. Cocci 5, acuminate, puberulous.

Indomalaysia. Common along roadsides in semi-evergreen forests in lower Ghats. November-June. *CJS* 15998, *HFP* 2539.

HIBISCUS Linnaeus *nom. cons.*

Stellately tomentose, scaly or prickly, erect or prostrate annual or perennial herbs, undershrubs or trees. Leaves usually palmate-pinnatisect, sometimes entire, often with nectariferous glands. Inflorescence a terminal raceme or a panicle (by abortion of upper leaves) or of solitary flowers. Flowers subsessile or with jointed pedicles. Epicalyx of 3-10 segments, free or connate, usually persisting, sometimes absent. Calyx 5-lobed to 5-parted, distinctly veined, often nectariferous, persistent. Corolla large or small, showy. Staminal column occasionally longer than corolla, wholly or partly (upper-half) antheriferous. Ovary 5-locular or incompletely 10-locular by false septation; ovules 3-many; styles distally branching into 5. Capsule; loculicidal; locules 5 or 10, with many glabrous or hairy, globose or reniform, smooth, rugose or tubercled, usually black seeds.

1 Plant prickly..... *H. furcatus*
1 Plant not prickly.
2 Epicalyx absent or minute..... *H. lobatus*
2 Epicalyx present and conspicuous.
3 Midrib of leaf with a large gland beneath near the base..... *H. cannabinus*
3 Midrib eglandular.

4 Scabrid herbs; leaves entire; seeds cottony.....*H. ovalifolius*
4 Herbs not scabrid; leaves incised or lobed; seeds glabrous.
5 Leaves incised to pinnatisect; plant hairy; calyx inflated.....*H. trionum*
5 Leaves distantly, shallowly lobed; plant tomentose; calyx not inflated.....
.....*H. panduriformis*

Hibiscus cannabinus L., Syst. Nat. ed. 10, 1149. 1759; Gamble, Fl. Madras 99(71). 1915; Rakshit & Kundu, Bull. Bot. Surv. India 12: 164. 1972.

Large herbs to 2 m. Upper leaves digitately 5-7-lobed; lobes crenate; midrib with nectariferous gland beneath, near base. Flowers solitary. Epicalyx segments 7, lanceolate, acute. Calyx campanulate, white-tomentose, bristly. Corolla large, bright yellow with purple base. Staminal column white, glandular-hairy. Capsule clothed with yellowish-brown hairs; seeds dotted with scales.

Generally cultivated in *Tropics*. In the District, often grown as a mixed crop along with Jowar (*Sorghum*) and Ragi (*Eleusine*). Commonly known as Deccan hemp, a valuable fiber. November. *HFP* 2502.

Hibiscus furcatus Willd., Enum. Hort. Berol. 736. 1800; Gamble, Fl. Madras 97(70). 1915; Rakshit & Kundu, Bull. Bot. Surv. India 12: 161. 1972.

Large, trailing or rambling, undershrubs. Leaves 3-5-lobed, crenate-serrate, sparsely hairy except on nerves which are densely hairy below. Epicalyx segments 8-12, hispid, each 2-lobed; upper lobe with an erect appendage. Calyx campanulate, hispid; petals to 5×2.5 cm, bright yellow with pink base. Capsule bristly-hairy; seeds smooth, black.

Tropical Africa and Tropical Asia, except S. E. Asia. Common along outskirts of wet deciduous to semi-evergreen forests in Ghats. September-January. *CJS* 12608, *HFP* 2709.

Hibiscus lobatus (J. A. Murr. Kuntze, Rev. Gen. Pl. 3: 19. 1898; Borssum, Blumea 14: 77. 1966; Rakshit & Kundu, Bull. Bot. Surv. India 12: 169. 1972. *Solandra lobata* J. A. Murr., Commentat. Soc. Regiae Sci. Goett. 6: 20, t. 1. 1785. *Hibiscus solandra* L'Herit., Stirp. Nov. 1: 103, t. 49. 1788; Gamble, Fl. Madras 98(70). 1915.

Erect herbs. Leaves entire to 3-5-lobed, to 6.5×5 cm, 5-7 ribbed, hairy. Flower usually solitary or racemed by reduction of leaves. Epicalyx absent or minute. Calyx lobes ovate, acute, hairy; corolla small, white. Capsule small; seeds many, minutely tubercled, brown.

Tropical Africa to Indomalaysia. Common in plains, usually in waste places and roadsides. September-October. *CJS* 11137, 14516, 15114.

Hibiscus ovalifolius (Forsk.) Vahl, Symb. 1: 50. 1790; *Urena ovalifolia* Forskal, Fl. Aegyp.-Arab. 124. 1775. *Hibiscus micranthus* L. f., Suppl.

308. 1781; Gamble, Fl. Madras 97(70). 1915; Rakshit & Kundu, Bull. Bot. Surv. India 12: 171. 1972.

Erect, scabrid, fruticose, small herbs. Leaves ovate-oblong, subcordate at base, acute at tip, serrate, to 2.2×1.6 cm. Flower axillary, solitary. Epicalyx of 7 linear, filiform segments. Calyx hairy; petals white or pink. Capsule globose; seeds black, cottony.

Africa, India. Rare, collected once at Belvathally in the eastern plains. September. *CJS* 17861.

Hibiscus panduriformis N. Burman, Fl. Ind. 151. t. 47, f. 2. 1768; Gamble, Fl. Madras 98(70). 1915; Rakshit & Kundu, Bull. Bot. Surv. India 12: 172. 1972.

Densely stellately or simple tomentose, erect undershrubs. Upper leaves to 8×4.5 cm, shallowly crenate, acute at tip, cordate at base. Flowers solitary, axillary, or racemed by abortion of leaves; stipules linear, 2-3-parted with filiform segments. Epicalyx of 10 segments. Calyx lobes campanulate, hairy; petals broadly obovate. Capsule ovoid, hairy, turning glabrescent. Seeds brownish-black, nearly glabrous.

Tropical Africa to Australia through Asia. Rare. In open country between Tiptur and Arsikere. November. *CJS* 11327.

Hibiscus trionum L., Sp. Pl. 697. 1753; Gamble, Fl. Madras 98(70). 1915; Rakshit & Kundu, Bull. Bot. Surv. India 12: 168. 1972.

Trailing annuals. Leaves highly pinnatisect, lower ones undivided, orbicular, ovate. Flowers axillary, solitary, yellow with dark purple center. Epicalyx lobes 8-12, linear. Capsule oblong, obtuse, with glandular-papillose, reniform, rugose seeds.

Africa, Continental Asia. Common in moist places in plains. November-May. *CJS* 11940, 13450, *HFP* 1391.

KYDIA Roxburgh

Trees; young parts stellately tomentose. Leaves entire, shallowly, distantly crenate or lobed, usually cordate at base, palmately 7-ribbed, stipulate. Inflorescence of axillary or terminal, many-flowered panicles. Flowers polygamous, pedicellate. Epicalyx 4-6-lobed, connate at base, spatulate-oblong, persistent. Calyx 5-lobed. Staminal column branching distally into 5; each branch tipped by a cluster of 4-6 connate anthers. Pistillode absent in male flower. Ovary 3-locular; ovules 2-3 in each locule; styles 3, ending in stigmatose arms; staminodes absent. Capsule depressed, globose, hard, loculicidal, subtended by the persistent epicalyx, usually 3-seeded. Seeds brown, rugose.

Kydia calycina Roxb., Pl. Cor. t. 215. 1811; Wight, Ic. t. 879-80. 1844-

45; Bedd., Fl. Sylv. t. 3. 1869; Gamble, Fl. Madras 93(67). 1915. *Kydia roxburghiana* Wight, Ic. t. 881. 1844-45.

Trees to 10-12 m. Leaves to 15×15 cm, ovate-orbicular, 7-ribbed, stellately pubescent above, glaucous below, shallowly-distantly crenate or with angular lobes. Panicle axillary or terminal, with dense tomentum. Epicalyx segments 4-6, spatulate-oblong, persistent. Calyx lobes broadly triangular acute; petals obovate, emarginate, fimbriate along margin, clawed and hairy below, white.

India, Burma. Common in semi-evergreen and wet deciduous forests of upper and lower Ghats. September-January. *CJS* 15591, *HFP* 1252.

MALVASTRUM A. Gray *nom. cons.*

Annual or perennial herbs or undershrubs. Leaves crenate-serrate, usually undivided, rarely shallowly lobed, without extra-floral nectaries. Inflorescence axillary or terminal, of clusters, spikes or sometimes solitary flowers. Flowers sessile or with a short unjointed pedicel. Epicalyx segments 3; calyx campanulate; corolla rotate, yellow; staminal column shorter than corolla. Carpels 10-15, each 1-ovulate; styles 10-15; stigmas usually capitate. Cocci not glochidiate, indehiscent, 1-seeded.

Malvastrum coromandelianum (L.) Garcke, Bonplandia 5: 295. 1857; Gamble, Fl. Madras 88(64). 1915; Borssum, Blumea 14: 152. 1966. *Malva coromandeliana* L., Sp. Pl. 687. 1753.

Leaves 3-3.5×3 cm, truncate at base; veins on the under-surface with appressed, simple or stellate hairs. Flowers usually solitary; epicalyx segments subulate, hairy.

Pantropical. Common in plains towards upper Ghats, usually on bunds of paddy fields or in open country. May-August. *CJS* 10647, 13573.

PAVONIA Cavanilles *nom. cons.*

Annual or perennial undershrubs or shrubs. Leaves undivided to palmately lobed or parted, usually palmately veined, rarely with nectaries. Inflorescence usually axillary, sometimes terminal, of clusters or solitary flowers. Flowers with jointed pedicels. Epicalyx 5-16-lobed, free or rarely connate at base. Calyx campanulate, 5-lobed, sometimes tubiform or urceolate; corolla rotate. Staminal column rarely longer than petals, antheriferous wholly or in upper part. Carpels 5, each 1-ovuled; styles 10; stigmas capitate, papillose. Cocci 5, trigonous, dorsally convex, sometimes winged, muricate or tuberculate, rarely smooth, sometimes with 2-3 retrorsely hairy awns.

1 Upper leaves not lobed; cocci hairy.....*P. odorata*
1 Upper leaves lobed; cocci glabrous.....*P. zeylanica*

Pavonia odorata Willd., Sp. Pl. 3: 837. 1800; Gamble, Fl. Madras 93(69). 1915.

Woody herbs. Leaves to 3.5 × 3.6 cm, ovate, acute, base cordate, palmately 3-5-veined. Epicalyx segments 12, subulate, hairy, free. Corolla pink. Coccus 1-seeded, puberulous.

East Tropical Africa, Pakistan, Peninsular India. Common in semi-arid regions in the eastern plains. January-June. *CJS* 16055, *HFP* 156.

Pavonia zeylanica (L.) Cav., Diss. 3: 134. 1787; Gamble, Fl. Madras 93(67). 1915. *Hibiscus zeylanicus* L., Sp. Pl. 697. 1753.

Woody herbs. Leaves to 1.5×1 cm, shallowly to deeply palmately lobed, 3-5-palmately veined. Epicalyx of 8-10 segments, setaceous, hairy. Corolla white. Coccus keeled, glabrous.

Tropical Africa, India, Sri Lanka, Mauritius. Common in semi-arid, dry, rocky terrain in the plains. All seasons. *CJS* 11076, 15333, 13921.

SIDA Linnaeus

Annual or perennial herbs or undershrubs. Leaves usually undivided, sometimes lobed. Flowers small, with jointed pedicels. Epicalyx absent. Calyx 5-parted, usually campanulate. Corolla rotate, usually yellow. Antheriferous filaments terminal on short column. Carpels 5-14, each 1-ovulate; styles and stigmas as many as carpels. Schizocarp usually enclosed by calyx; cocci more or less trigonous, sometimes aristate, 1-seeded, indehiscent. Seeds usually smooth.

1 Cocci aristate.
2 Arista retrorsely ciliate.....*S. cordifolia*
2 Arista not retrorsely ciliate.....*S. spinosa*
1 Cocci acute.
3 Pedicel jointed below middle.....*S. rhombifolia*
3 Pedicel jointed above middle.
4 Pedicels longer than leaves.....*S. cordata*
4 Pedicels shorter than leaves.....*S. acuta*

Sida acuta N. Burman, Fl. Ind. 147. 1768; Gamble, Fl. Madras 90(64). 1915; Borssum, Blumea 14: 186. 1966.

Erect fruticose, nearly glabrous herbs. Leaves to 5×1 cm, ovate to linear, serrate, cuneate, subcordate at base. Stipules of the pair dissimilar. Pedicel jointed above middle, as long as the petiole or longer; cocci 7, acute, glabrous.

Pantropical. Common, a weed of open, dry places. September-October. *CJS* 9143, *HFP* 2101.

Sida cordata (N. Burman) Borssum, Blumea 14: 182. 1966. *Melochia cordata* N. Burman, Fl. Ind. 143. 1768. *Sida veronicifolia* Lam., Encycl. 1: 5. 1783; Gamble, Fl. Madras 89(64). 1915 ('*veronicaefolia*').

Erect or ascending herbs; branches tomentose. Leaves to 2.5×2.5 cm, orbicular, cordate at base, crenate-serrate, sparsely hairy. Pedicel jointed near tip, longer than leaves. Cocci 5, muticous.

Pantropical. Rare, collected once along Tiptur-Arsikere road, on open sandy soil. December. *CJS* 11908.

Sida cordifolia L., Sp. Pl. 684. 1753; Gamble, Fl. Madras 89(64). 1915; Borssum, Blumea 14: 199. 1966.

Tomentose herbs. Leaves to 1.5×1 cm, ovate, acute, cordate at base, crenate-serrate. Pedicel jointed above middle. Cocci 12, aristate; arista retrorsely ciliate.

Pantropical. Common, in open country and bunds of fields. July-October. *CJS* 15384, *HFP* 480.

Sida rhombifolia L., Sp. Pl. 684. 1753; Gamble, Fl. Madras 90(65). 1915; Borssum, Blumea 14: 193. 1966.

Annual woody herbs. Leaves alternate, 2.5×2 cm, highly variable, obovate, rhomboid, sometimes lanceolate. Pedicel jointed below the middle; cocci 7, acute.

Indomalaysia. Rare, along roadsides, as weeds in estates, sometimes in open countryside. October. *CJS* 9213, 9260, 11141.

Sida spinosa L., Sp. Pl. 683. 1753; Gamble, Fl. Madras 89(64). 1915; Borssum, Blumea 14: 191. 1966.

Diffuse herbs. Leaves to 2×0.8 cm, lanceolate, acute, nearly truncate at base, serrate. Pedicel jointed above middle. Cocci 5, aristate, not hairy.

Tropics. Common weed in dry fields. December. *CJS* 11938.

THESPESIA Solander ex Correa *nom. cons.*

Shrubs or trees, stellately tomentose or young parts scaly. Leaves undivided, sometimes palmately lobed, entire, sometimes with extrafloral nectaries. Inflorescence of 1-few flowers in axillary clusters or solitary. Epicalyx 3-6-lobed, free, deciduous; calyx woody, cupular, truncate at mouth except for small teeth, persistent; corolla large, showy, usually yellow with purple base. Staminal column antheriferous throughout. Ovary 5-locular or incompletely 10-locular, each locule 3-many-ovulate; style 1; stigmas clavate, ribbed. Capsule woody, dehiscent or not; seeds glabrous or tomentose.

1 Midrib glandular..... *T. lampas*
1 Midrib eglandular..... *T. populnea*

Thespesia lampas (Cav.) Dalzell ex Dalzell & Gibson, Bombay Fl. 19. 1861; Borssum, Blumea 14: 116. 1966. *Hibiscus lampas* Cav., Diss. 3: 154, t. 56, f. 2. 1787; Wight, Ic. t. 5. 1838; Gamble, Fl. Madras 98(71). 1915.

Shrubs 2-2.5 m, tomentose with minute, stellate hairs. Leaves to 7×7 cm, ovate, acute, sometimes lanceolate, cordate at base, 3-5-ribbed. Flowers solitary, 6 cm across; corolla bright yellow with purple base.

East Africa to S. E. Asia. Common in wet deciduous to semi-evergreen forests. October-December. *CJS* 12118, 15410.

Thespesia populnea (L.) Sol. ex Correa, Ann. Mus. Natl. Hist. Nat. 9: 290, t. 8, f. 1. 1807; Wight, Ic. t. 8. 1838; Bedd., Fl. Sylv. t. 63. 1870; Gamble, Fl. Madras 101(72). 1915; Fosberg & Sachet, Smithsonian Contrib. Bot. 7: 8. 1972. *Hibiscus populneus* L., Sp. Pl. 694. 1753.

Shrubs or trees to 4-12 m, often scaly. Leaves to 10×6 cm, cordate at base, entire, 3-5-ribbed. Flowers solitary. Corolla rotate, bright yellow with purple base, often turning brick red with age.

Tropics. Common roadside tree, often cultivated. *HFP* 1.

* * *

Gossypium L., several cultivars are grown. They key with *Thespesia* but are easily distinguished by their glandular lacerate bracts.

URENA Linnaeus

Annual or perennial undershrubs. Leaves divided or not, crenate-serrate, palmately veined, with gland beneath on the midrib. Flowers bisexual, regular; pedicels not jointed. Epicalyx segments 4, connate at base; calyx campanulate; its costae often bearing nectaries. Corolla rotate, yellow or pink. Staminal column antheriferous only in the upper half. Ovary 5-locular, each uniovulate; styles 10; stigmas capitate. Cocci usually glochidiate.

Urena lobata L., Sp. Pl. 692. 1753; Gamble, Fl. Madras 92(66). 1915; Borssum, Blumea 14: 138. 1966.

1 Leaves unlobed; epicalyx cupular in fruit.....ssp. *lobata*
1 Leaves deeply lobed; epicalyx spreading or reflexed in fruit.....ssp. *sinuata*

ssp. **lobata**

Erect annual herbs. Leaves to 5×6 cm, distantly sinuate, acute at tip, truncate at base. Corolla pink. Cocci surrounded by appressed, cupular epicalyx.

Pantropical. Common along roadsides in Ghats. November-February. *CJS* 11550, 12103, 12238.

ssp. **sinuata** (L.) Borssum, Blumea 14: 142. 1966; *Urena sinuata* L., Sp. Pl. 692. 1753; Gamble, Fl. Madras 92(66). 1915.

Woody annuals. Leaves to 6×6 cm, conspicuously glaucous beneath, deeply palmately lobed, each lobe further segmented. Corolla pink. Cocci with reflexed or spreading epicalyx.

Pantropical. Common along roadsides in upper Ghats. October. *CJS* 12014, 15360.

40. LECYTHIDACEAE

K. N. Gandhi

CAREYA Roxburgh

Shrubs or trees. Leaves alternate, often crowded at apices of branchlets, estipulate; blade simple, entire to denticulate; venation pinnate. Inflorescence a terminal raceme or spike. Flowers bisexual, regular, 4-merous. Calyx tube slightly produced beyond ovary; lobes imbricate, persistent. Petals free, imbricate, fleshy. Stamens numerous, subconnate at base; filaments subulate; outermost longer; innermost shorter and sterile; anthers short, medifixed. Disc intrastaminal. Ovary inferior, 4-5-locular; locule with 2 rows of many, axillary ovules; stigma capitate. Fruit a globose, fibrous berry, crowned with calyx lobes, many-seeded.

Careya arborea Roxb., Pl. Cor. t. 218. 1811; Bedd., Fl. Sylv. t. 205. 1872; Gamble, Fl. Madras 488(345). 1919.

Deciduous trees. Leaves crenate-denticulate, obovate, shortly acuminate, cuneate, to 10-30×5-15 cm, glabrous. Inflorescence a short, few-flowered spike; peduncle woody. Calyx lobes ovate, obtuse at apex. Petals yellowish-white, elliptic-oblong, obtuse, 4-5 cm long. Stamens 4-6 cm long. Berry 5-7 cm long, green.

Himalayas to Sri Lanka. Conspicuous, deciduous trees in dry plain and in open places in upper Ghats. Flowers in February-April. Fruits in November-January. Flowers and fruits are foetid. *CJS* 12767, *HFP* 2808.

41. DROSERACEAE

T. P. Ramamoorthy

DROSERA Linnaeus

Terrestrial, marsh or sometimes aquatic, insectivorous herbs. Leaves alternate, sometimes in rosettes, stipulate or not, provided with sessile

Fig. 31. DROSERACEAE. *A. Drosera indica*: habit; *Aa*, flower; *Ab*, transverse section of ovary. *B. Drosera burmannii*: habit; *Ba*, vertical section of flower. *C. Drosera peltata*: habit; *Ca*, flower.

or stalked, sticky glands. Inflorescence of terminal or leaf-opposed, usually circinate, helicoid cymes, bracteate or not. Flowers bisexual, regular. Calyx mostly 5-lobed, imbricate, persistent; petals as many as sepals, free, marcescent, usually persisting. Stamens as many as petals, free, alternating with them. Ovary superior, 1-locular; ovules many, on 2-5 parietal placentas; styles 2-5, free or connate below; stigmas indistinct. Fruit many-seeded, 2-5-valved, loculicidal capsule.

1 All leaves in a basal rosette.....*D. burmannii*
1 Some leaves cauline.
2 Leaves orbicular-peltate; plant with subterranean tuber.....*D. peltata*
2 Leaves linear; plant without subterranean tuber.....*D. indica*

Drosera burmannii Vahl, Symb. 3: 50. 1794; Wight, Ic. t. 944. 1845; Gamble, Fl. Madras 452(320). 1919.

Acaulescent herbs to 15 cm with a basal rosette of obovate or orbicular, stipulate leaves; blade to 1 × 1 cm. Scape terminal, circinate, few-many-flowered. Flowers white. Calyx 5-lobed; lobes elliptic, acute; petals 5, obovate.

West Africa to N. E. Australia. Common in wet meadows around tanks in plains and upper Ghats; easily discernible by the red color of the plant. August (late monsoon) to March. *CJS* 16065, *HFP* 1265.

Drosera indica L., Sp. Pl. 282. 1753; Gamble, Fl. Madras 452(32.). 1919.

Slender, caulescent herbs to 20 cm with glandular-hairy stem. Leaves estipulate; lower leaves recurved, the upper leaves erect, filiform, to 3 cm long, shortly petioled, glandular-hairy. Inflorescence leaf-opposed. Flowers pink. Sepals 5, acute; petals pink, obovate.

Tropical Africa to Australia. Common in wet, fallow fields and meadows in plains and upper Ghats. August-October. *CJS* 15218, 15156.

Drosera peltata J. E. Sm. in Willd., Sp. Pl. 1: 1546. 1797; Gamble, Fl. Madras 452(320). 1919.

Perennial herbs to 15-20 cm, with an underground tuber. Basal leaves in a rosette, cauline leaves alternate, petioled; blade usually peltate, glandular. Inflorescence 2-many-flowered. Flowers white. Sepals ovate, acute, serrate; petals obovate, rounded. Styles 3, branching and brush-like.

India to Australia. Common on open hill-sides of upper Ghats. August-October. *CJS* 15263, *HFP* 439.

42. FLACOURTIACEAE

T. P. Ramamoorthy

Shrubs or trees, sometimes climbing, rarely armed. Leaves alternate;

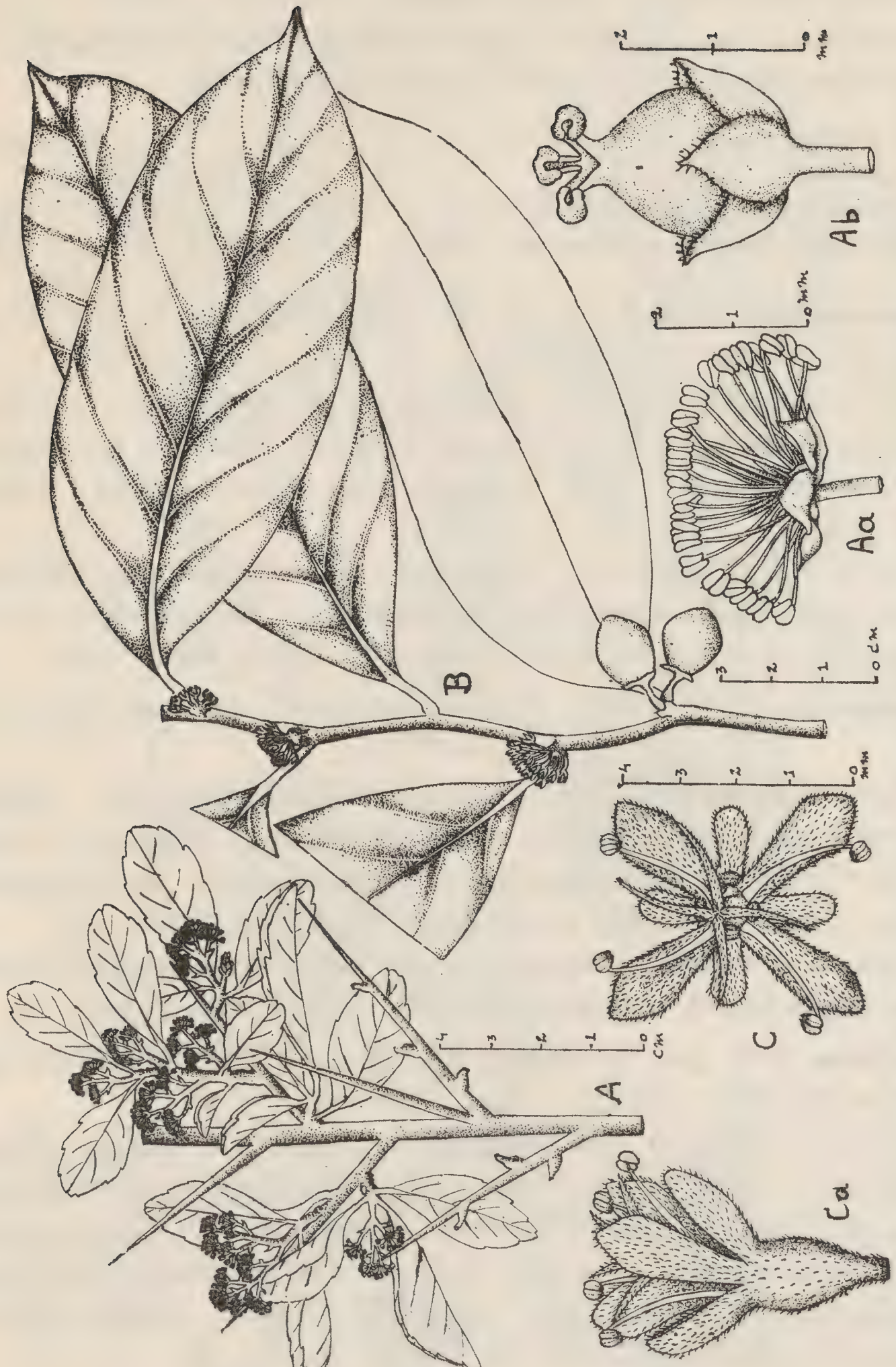


Fig. 32. FLACOURTIACEAE. *A. Flacourtia indica*: flowering twig; *Aa*, male flower; *Ab*, female flower. *B. Casearia esculenta*: a twig. *C. Homalium zeylanicum*: flower, top view; *Ca*, same, lateral view.

stipules deciduous, often wanting; blade simple, entire or crenate-serrate, pinnately or subpalmately veined. Inflorescence axillary, extra-axillary, subterminal, racemose or cymose, sometimes fascicled, rarely flower solitary, ebracteate. Flowers bisexual or unisexual (dioecious or polygamous), regular. Sepals 3-6, usually 5, united below, imbricate, persistent, occasionally accrescent; petals 3-8, occasionally more, free, imbricate or valvate; disc when present entire, lobed, sometimes glandular. Stamens 4-many, free or fused, often alternating with staminodes; anthers 2-celled, connective often produced into an appendage. Ovary superior, rarely half-inferior, 1-locular, sometimes incompletely 2-8-locular by intruding placentas; ovules few-many, on 2-8 parietal placentas; style 1 or 2-5; stigmas capitate. Fruit either an indehiscent fleshy or dry berry, or drupaceous or a 2-3 valved septicidal capsule. Seeds many.

1 Petals absent.
2 Flower bisexual; fruit a capsule; plant unarmed, with pinnately veined leaves ..... **Casearia**
2 Flower unisexual; fruit a berry; plant often armed, with subpalmately veined leaves ..... **Flacourtia**
1 Petals present.
3 Petals with inner scales; fruit a hard berry ..... **Hydnocarpus**
3 Petals without inner scales; fruit a capsule or berry.
4 Stamens 4, alternating with staminodes; fruit a capsule ..... **Homalium**
4 Stamens numerous; staminodes 0; fruit a berry ..... **Scolopia**

CASEARIA N. Jacquin

Shrubs or trees. Leaves alternate, distichous, with deciduous stipules, entire or crenate-serrate, pinnately veined. Inflorescence of axillary or extra-axillary, sessile clusters. Flowers bisexual; pedicels usually jointed above their base, covered by scale-like bracts. Calyx 5-lobed, imbricate; petals none. Stamens usually 8, alternating with staminodes, both fused below to form a ring, attached to calyx tube. Ovary superior, 1-locular; ovules few-many, usually on 3 parietal placentas; style simple; stigma capitate, sometimes 3-lobed. Fruit a 2-3-valved, succulent capsule, with usually arillate seeds.

1 Mature leaves, petioles tomentose ..... *C. elliptica*
1 Mature leaves, petioles glabrous.
2 Pedicels, tepals hairy ..... *C. bourdillonii*
2 Pedicels, tepals glabrous ..... *C. esculenta*

Casearia bourdillonii Mukherjee, Bull. Bot. Soc. Bengal 19(2): 109. 1965. *Casearia varians* sensu Bedd., Fl. Sylv. t. 208. 1872, non Thwaites, 1858; Gamble, Fl. Madras 521(368). 1919.

Tree to 10 m in height. Leaves to 20×7 cm, entire, elliptic-lanceolate, acuminate at tip, rounded or narrowed at base, glabrous. Pedicel hairy.

Tepals hairy. Filaments bearded; staminodes densely hairy.

South W. India. Occasional in lower Ghats, along outskirts of semi-evergreen forests. February. *CJS* 11625.

Casearia elliptica Willd., Sp. Pl. 2: 628. 1800; Wight, Ic. t. 1849. 1852; Raizada, Indian Forester 92: 304. 1966. *Casearia tomentosa* Roxb., Fl. Ind. 2: 421. 1832; Gamble, Fl. Madras 521 (368). 1919.

Large shrubs or small trees, reaching 4-7 m in height, tomentose on young parts. Leaves to 14×5.5 cm, ovate, elliptic-lanceolate, acute, rounded and asymmetrical at base, tomentose. Pedicel tomentose. Tepals hairy.

India to Australia through Indomalaysia. Common in wet deciduous forests in upper Ghats. February-May. *CJS* 16331, *HFP* 1587.

Casearia esculenta Roxb., Fl. Ind. 2: 422. 1832; Gamble, Fl. Madras 521(368). 1919.

Trees. Leaves to 15×6 cm, ovate, elliptic-acuminate, rounded or narrowed at base, glabrous; acumen often folded. Flower glabrous. Tepals imbricate, glabrous. Staminodes pilose at tip.

India, Sri Lanka. Common in wet deciduous to semi-evergreen forests in Ghats. April-August. *CJS* 11691, 16865.

Note: *Casearia rubescens* Dalz. is supposed to be distinguished by minute pubescence on the pedicels in flower and fruit. Some specimens (*CJS* 13615, 13867, 14198, 14413, 16384; *HFP* 195, 1640) show minute pubescence of the pedicels in various degrees. Without study of types and more material we hesitate to recognize or synonymize *C. rubescens* but this character seems insufficient.

Other specimens (*HFP* 2861, *CJS* 10929, 14006) are distinctive for the translucent alveolae (minor venation) of the leaves and a thinner epicarp of the fruit (not fleshy). These collections could not be matched at Kew and may prove to be a new taxon.

FLACOURTIA L'Heritier

Shrubs or trees, the trunk often armed. Leaves alternate, spiralled, estipulate, entire or crenate-serrate. Inflorescence axillary, of branching cymes. Flowers unisexual, rarely bisexual. Sepals 4-6, usually 4, subpersistent; petals none. Disc extra-staminal; stamens numerous; pistillode 0. Ovary incompletely 5-locular; styles 5. Berry fleshy, many-seeded.

1 Midrib glabrous beneath.....*F. indica*
1 Midrib hairy beneath.....*F. montana*

Flacourtia indica (N. Burman) Merrill, Interpr. Rumph. Herb. Amb. 377. 1917; Sant., Fl. Khandala ed. 3, 10. 1967. *Gmelina indica* N. Burman, Fl. Ind. 132, t. 39, f. 5. 1768. *Flacourtia ramontchi*

L'Herit., Stirp. Nov. 3: 59, t. 30 & 30B. 1785; Gamble, Fl. Madras 54(39). 1915. *Flacourtia sepiaria* Roxb., Pl. Cor. t. 68. 1795; Gamble, Fl. Madras 54(39). 1915.

Shrubs or trees, usually armed; spines at the base of the trunk often branched. Leaves 2-12×1-5 cm, obovate-ovate, acute, acuminate or sometimes emarginate, crenate-serrate, glabrous or hairy. Tepals 4, united below. Anther versatile. Berry fleshy, globose, turning red with age.

Pantropical. Common in scrub and the wet deciduous forests in upper Ghats. March-September. *CJS* 11685, 14327, 14004.

Flacourtia montana Graham, Cat. Pl. Bombay 10. 1839; Gamble, Fl. Madras 54(39). 1915.

A large tree, often armed. Leaves 8-15×4-6 cm, elliptic, oblong, acuminate, base rounded, crenate, pubescent on the midrib below. Flowers unisexual, white. Berry fleshy, few seeded.

South W. India. Occasional, in semi-evergreen forests of lower Bisle Ghat. *CJS* 16285, *HFP* 1463.

Note: Both Gamble (*l. c.*) and J. Hooker describe it as a spinous tree. Our plants did not show any spines.

HOMALIUM N. Jacquin

Shrubs or trees. Leaves alternate; stipules minute, deciduous or none; blade entire, crenate-serrate, penninerved. Inflorescence axillary, in racemes or sometimes panicles, usually bracteate. Flowers bisexual; sepals 4-8, fused below and connate with ovary, sometimes accrescent; sepaloid petals inserted on calyx mouth, alternating with calyx lobes, rarely persistent. Stamens epipetalous, 4 or many in 3-4 fascicles, sometimes alternating with staminodes. Ovary almost inferior, 1-locular; ovules few-many, on 4 parietal placentas; styles 4; stigma capituliform. Capsule 2-4-valved, many-seeded.

Homalium zeylanicum (Gardner) Bentham, J. Linn. Soc., Bot. 4: 35. 1860; Bedd., Fl. Sylv. t. 210. 1872; Gamble, Fl. Madras 522(369). 1919. *Blackwellia zeylanica* Gardner, Calcutta J. Nat. Hist. 7: 452. 1847. *Homalium tetrandra* Wight, Ic. t. 1851. 1852.

Trees. Leaves to 9.5×4.5 cm, elliptic, acuminate, narrowed at base, crenate. Fascicles of flowers collected into axillary racemes. Flowers white, with offensive smell. Sepals 4, ciliate along margin; petals glabrous. Stamens 4, alternating with glandular staminodes. Ovary globose, pubescent.

South W. India. Fairly common in semi-evergreen forests in lower Bisle Ghat. February-May. *CJS* 16425, *HFP* 1654.

HYDNOCARPUS Gaertner

Usually dioecious trees or shrubs. Leaves alternate; stipules deciduous early; blade entire or serrate, penninerved. Inflorescence axillary, in cymes or racemes, sometimes fascicled, rarely of solitary flowers. Flowers unisexual, regular; bracts small, sometimes subpersistent. Sepals usually 5, shortly connate at base, imbricate, deciduous; petals usually 5 free, imbricate, mostly with a fleshy or pilose scale at base. Stamens 5-many, free; anther cells 2, often diverging; dehiscence lateral; pistillode rarely present. Staminodes 5-many. Ovary 1-locular; ovules few-many, on 3-6 placentas; stigma sessile, 3-5-lobed. Fruit usually globose, sometimes elliptic.

Hydnocarpus laurifolia (Dennst.) Sleumer, Bot. Jahrb. 69: 33. 1938.
Munnicksia laurifolia Dennst., Schluess. Hort. Ind. Mal. 27. 1818.
Hydnocarpus wightiana Blume, Rumph. 4: 22. 1848; Gamble, Fl. Madras 52(37). 1915.

Trees. Leaves to 20×4.5 cm, lanceolate, acuminate, rounded or subcordate at base, serrate. Inflorescence axillary, in cymes, rarely of solitary flowers. Sepals pubescent. Petals ciliate along margin, ovate; scale woolly, more than half as long as petals. Pistillode none. Ovary globose, woolly; stigma 5-lobed. Berry to 6×5.5 cm, globose, hard, usually brown tomentose, black when young.

South W. India. Common in wet deciduous to semi-evergreen forests, in upper and lower Ghats. It flowers between January and May and may be found in fruit during most of the year. *CJS* 13165, 14788, *HFP* 87.

Note: Gaertner considered *Hydnocarpus* as feminine and this has been followed by most workers.

SCOLOPIA Schreber *nom. cons.*

Shrubs or trees, sometimes armed. Leaves alternate; stipules deciduous; blade entire, crenate, pinnately veined, usually coriaceous, occasionally glandular below near base. Inflorescence axillary, racemose, rarely panicled, sometimes of solitary flowers. Flowers bisexual, regular. Sepals 3-6, shortly connate below, imbricate; petals sepaloid, as many as sepals. Stamens many, free; anther 2-celled, dehiscing by slits; connective produced into a narrow appendage. Ovary with 3-4 parietal placentas; style persistent; stigmas sometimes lobed. Berry fleshy, few-seeded.

Scolopia crenata (Wight & Arn.) Clos, Ann. Sci. Nat. Bot. 4, 8: 250. 1857, *excl. specim. Philippin.* Bedd., Fl. Sylv. t. 78. 1871; Gamble, Fl. Madras 52(38). 1915; Sleumer, Blumea 20: 39. 1972. *Phoberos*

crenatus Wight & Arn., Prodr. 29. 1834.

Trees; trunk often with branching spines at base. Leaves to 10.5 × 4.5 cm, elliptic-lanceolate, cuneate at base, acute at tip; crenations often glandular. Inflorescence in racemes; sepals 5, ciliate; petals 5. Stamens many. Placentas 4. Drupe to 2×2 cm, ovate, nearly globose, topped by base of style.

S. Asia through W. Malaysia. Common in upper Ghats toward Devarunde. March-August. *CJS* 12994, 13484, *HFP* 202.

43. VIOLACEAE

T. P. Ramamoorthy

Annual or perennial herbs, sometimes arborescent shrubs. Leaves alternate, rarely opposite, occasionally in rosettes, stipulate, simple, pinnately or palmately veined. Flowers bisexual, rarely polygamo-dioecious, regular or irregular, bracteolate or not; pedicels sometimes jointed. Sepals 5, free or shortly connate, imbricate. Petals 5, free, imbricate, equal or unequal; the lowermost larger and often spurred. Disc usually annular; stamens 5, free; filaments short; anthers 2-celled; connective produced into a narrow, membranous appendage, usually free from anthers. Ovary superior, 1-locular; ovules few-many, on pareital placentas; style simple, sometimes clavate; stigma entire or variously divided. Fruit a 2-5-valved, 2-many-seeded capsule. Seeds smooth or striate.

1 Herbs; one of the petals larger and clawed.....**Hybanthus**
1 Trees; all petals equal.....**Rinorea**

HYBANTHUS N. Jacquin *nom. cons.*

Herbs or shrubs. Leaves alternate, shallowly crenate-serrate. Flowers generally solitary, bisexual, irregular, bracteolate; pedicels jointed. Petals unequal. Two stamens with filiform appendages on anterior filaments. Style clavate at tip, curved; stigma porrect. Capsule 3-valved.

Hybanthus enneaspermus (L.) F.v. Muell., Fragm. Phyt. Austr. 10: 81. 1876; Tennant, Kew Bull. 16: 431. 1963. *Viola enneasperma* L., Sp. Pl. 937. 1753. *Viola suffruticosa* L., Sp. Pl. 937. 1753. *Ionidium suffruticosum* (L.) Ging. ex DC., Prodr. 1: 311. 1824; Wight, Ic. t. 308. 1840; Gamble, Fl. Madras 49(35). 1915. *Hybanthus suffruticosus* (L.) Baillon, Bot. Med. 2: 841. 1884.

Fruticose, branching herbs. Leaves to 3×0.2 cm, linear-lanceolate, shallowly crenate. Pedicel jointed near bracteoles above middle.

Fig. 33. VIOLACEAE. *A. Rinorea bengalensis*: flowering branch; *Aa*, flower; *Ab*, same, without petals; *Ac*, same, vertical section; *Ad*, transverse section of ovary; *Ae*, fruit; *Af*, same, in section. *B. Hybanthus enneaspermus*: habit; *Ba*, flower.

Flowers pink. The lowermost petal largest with an elongate, spurred claw toward base and an obovate, broad limb above. Seeds striate.

Africa to Australia. Common in dry rock-sandy terrain in plains. July-December. *CJS* 8747, 14265.

Note: Robson (*Bot. Soc. Brot.* 32: 164. 1958) recognized *H. enneaspermus* and *H. suffruticosus* as distinct species. However, Dalzell and Gibson (*Bombay Fl.* 12. 1861) united these two under *Ionidium enneaspermum* (L.) Vent. as pointed by Tennant (*l. c.*).

RINOREA Aublet

Shrubs or trees. Leaves alternate or subopposite, crenate-serrate, pinnately veined. Inflorescence in racemes, panicles, corymbs, cymes sometimes fascicled, axillary or terminal. Flowers bisexual, regular; pedicel articulate or not. Petals equal. Stamens placed on the inner side of annular disc. Ovules 1-3; style straight; stigma terminal. Capsule 3-valved; seeds smooth.

Rinorea bengalensis (Wall.) Kuntze, Rev. Gen. Pl. 1: 42. 1891; Jacobs, Blumea 15: 128. 1967. *Alsodeia bengalensis* Wall., Trans. Med. Soc. Calcutta 7: 224. 1835. *Alsodeia zeylanica* Thwaites, Enum. 21. 1858; Gamble, Fl. Madras 49(35). 1915; Bedd., Fl. Sylv. t. 229. 1872.

Small trees. Leaves to 16×6 cm, elliptic, acute at both ends. Primary nerve axils with domatia; stipules lanceolate, acute. Flowers fascicled, axillary, white. Pedicels not jointed. Petals recurved at tip.

South W. India, Sri Lanka. Common along river banks, in undergrowth of semi-evergreen forests in lower Ghats. All seasons. *CJS* 15993, 16816.

44. PASSIFLORACEAE

K. N. Gandhi

Herbs or shrubs, usually climbing with tendrils. Leaves generally alternate; stipules present, sometimes caducous or 0; blade simple or compound, frequently glandular beneath; venation pinnate or palmate. Flowers bisexual, unisexual or polygamous, regular, mostly 4-5-merous, bracteolate. Calyx gamosepalous, often petaloid or fleshy, persistent; lobes imbricate. Petals attached to calyx tube, free or connate at base, often marcescent, sometimes 0. Corona (enations of perianth) often present, situated between corolla and androecium. Stamens 4-10, from the rim of receptacle or from corona base or on a gynandrophore; anthers 2-celled. Ovary superior, on a gynophore or androgynophore, 1-locular, with many ovules on 3-5 parietal placentas; styles 3-5; stigmas reniform,

flat or capitate. Fruit a berry or capsule; seeds many, often with fleshy aril.

1 Tendrils only on inflorescence. Flowers unisexual; corona inconspicuous....**Adenia**
1 Tendrils only in leaf axils. Flowers bisexual; corona conspicuous.....**Passiflora**

ADENIA Forskal

Climbing, generally dioecious. Stipules 0 or inconspicuous; leaf blade entire or lobed, often with few, circular, flat glands beneath or at tip of petiole. Inflorescence a paniculate cyme, with 1 or more branches tendrillar; bracteoles small. Flowers generally unisexual. Calyx tubular or campanulate, 4-5-lobed. Petals free, inserted at the base or throat of calyx, smaller than calyx lobes. Corona of 4-5 glandular scales or absent. Stamens at the base of calyx tube; filaments short, free or connate; anthers linear, basifixed. Pistillode short or 0. Staminodes 4-5, linear. Ovary on a short gynophore, subangled; styles 3, connate at base; stigmas capitate or flat. Fruit a loculicidal, 3-valved capsule; seeds arillate, compressed, pitted.

Adenia hondala (Gaertner) de Wilde, Blumea 15; 265. 1967. *Granadilla hondala* Gaertner, Fruct. 11: 480. 1791. *Modecca palmata* Lam., Encycl. 4: 209. 1797. *Adenia palmata* (Lam.) Engl., Bot. Jahrb. 14: 375. 1892; Wight, Ic. t. 201. 1839; Gamble, Fl. Madras 525(371). 1919.

Stem pachypodous at base. Petiole 5 cm long; leaf blade usually palmately 3-lobed or 5-lobed, to 18×12 cm; lobes acuminate. Peduncle 4-6 cm long. Flowers 2 cm across, greenish-yellow; pedicels 1-1.5 cm long, bearing a circular bracteole. Petals linear-lanceolate, pilose along the the margin. Staminal filaments connate below. Capsule 6 cm across, globose, red with age.

Western Ghats, Sri Lanka. Frequent, climber in undergrowth along upper Ghats. March-July. *CJS* 13863, 16759.

PASSIFLORA Linnaeus

Tendrils axillary. Leaves entire or palmately lobed, often with glands at base, along the margin or on petiole; stipules spathaceous or small. Inflorescence racemose or cymose or flowers solitary or in pairs, axillary. Flowers bisexual, fairly large, distinctly peduncled. Calyx deeply 5-lobed. Petals 5, inserted at the throat of calyx tube. Corona of 1-many rows of filiform appendages, 1-few membranous folds lower down and a shallow cup surrounding gynandrophore. Stamens 5 or more, from a gynandrophore; anthers dorsifixed. Ovary generally on a gyno-

phore; styles 3; stigmas capitate. Fruit a berry; seeds arillate, pitted.

1 Leaves glabrescent. Bracts simple.....*P. subpeltata*
1 Leaves with silky hairs. Bracts bipinnatifid.....*P. foetida*

Passiflora subpeltata Ortega, Nov. Rar. Pl. Hort. Matrit. 6: 78. 1798; Green, Kew Bull. 26: 557. 1972. *Passiflora calcarata* Masters, Trans. Linn. Soc. London 27: 638. 1871; Gamble, Fl. Madras 524 (370). 1919.

Glabrescent. Petiole 3-4 cm long; stipules ovate, obtuse, to 3×2 cm; leaf blade palmately 3-lobed, truncate or shallowly cordate at base, to 7×7 cm, often glaucous beneath. Peduncle 2 cm long; bracteoles ovate, acute, membranous. Flowers 3 cm across, white. Berry elliptic, smooth, 6 cm across.

Introduced from Madagascar. Occasional on hedges across the plain and in upper Ghats. January-June. *CJS* 12491, 16325.

Passiflora foetida L., Sp. Pl. 959. 1753; Gamble, Fl. Madras 524(370). 1919.

Silky-pubescent. Petiole 4-5 cm long; stipules divided into filiform segments; leaf blade ovate in outline, usually 3-lobed, to 10×9 cm; lobes subacute at apex, terminal lobe larger. Flowers solitary; peduncle 4-6 cm long; involucral bracts bipinnatifid, surrounding flowers and fruits. Sepals mucronate. Corolla white, 3 cm across. Berry globose, smooth, 2 cm across.

Introduced from Tropical America. Rare, in hedges. March-October. *CJS* 13286, *HFP* 2836.

45. BIXACEAE

T. P. Ramamoorthy

Unarmed trees or arborescent shrubs. Leaves alternate; stipules minute, deciduous, sometimes glandular; blade entire or palmately lobed; venation palmate. Inflorescence in racemes, corymbs or panicles, usually terminal. Flowers bisexual, regular, pedicellate. Sepals 4-5, free, imbricate; petals 4-7, alternating with sepals, free, imbricate; disc annular, sometimes absent. Stamens numerous, free, sometimes shortly connate at base; anthers 2-celled, usually poricidal. Ovary superior, 1-locular or incompletely 2-3-locular; ovules many, on parietal placentas; style sometimes thick; stigma indistinct, lobed or not. Fruit a loculicidal, bristly or smooth capsule; seeds many.

1 Leaves entire, dotted with minute red glands; flower pink; fruit bristly, 2-valved.....**Bixa**
1 Leaves lobed, without red glands; flower yellow; fruit smooth, 3-5-valved.....**Cochlospermum**

Fig. 34. BIXACEAE. *A. Bixa orellana:* flowering branch; *Aa*, flower; *Ab*, same, vertical section; *Ac*, ovary, cross section; *Ad*, fruit.

BIXA Linnaeus

Leaf blade entire, ovate-acuminate, cordate at base, with minute red glands. Pedicel with 4-5 glands at tip. Petals entire. Stamens on an annular, hypogynous disc; anthers globose. Ovary bristly, 1-locular; ovules numerous, on 2 placentas. Capsule 2-valved, compressed, bristly; seeds covered by red powder.

Bixa orellana L., Sp. Pl. 512. 1753; Bedd., Fl. Sylv. t. 79. 1871; Gamble, Fl. Madras 51(37). 1915.

Leaf blade to 14×9 cm, 5-nerved. Flowers pink. Sepals obovate, concave, obtuse at tip, 0.5-0.7 cm, sometimes unequal, obovate. Capsule ovate, acute, to 6×2.8 cm.

Introduced from America. Grown as a shade tree in coffee estates at Chikkanahalli. December-August. *HFP* 465, 1248.

COCHLOSPERMUM Kunth ex A. P. de Candolle *nom. cons.*

Leaf blade palmately lobed, usually glaucous tomentose below. Flowers large, showy, Petals usually emarginate; disc none. Filaments shortly connate at base; anthers linear. Ovary 1-locular or incompletely 3-5-locular; ovules many, on 3-5 placentas. Capsule 3-5-valved, terete, smooth; seeds covered by cottony hairs.

Cochlospermum religiosum (L.) Alston in Trimen, Handb. Fl. Ceylon 6: 14. 1931. *Bombax religiosum* L., Sp. Pl. 552. 1753. *Cochlospermum gossypium* DC., Prodr. 1: 527. 1824; Gamble, Fl. Madras 50(36). 1915.

Deciduous trees. Leaves cordate at base, 7-nerved; lobes acute. Flower to 8 cm broad; petals bright golden yellow. Anthers linear, falcate. Capsule to 10×8 cm, obovoid; seeds reniform, brown, woolly.

India, introduced elsewhere. Rather local in distribution, common in the deciduous forests at Gorur and in the hilly tracts in the eastern plains at Nagpuri. January-March. *CJS* 16062, 16607.

46. ANCISTROCLADACEAE

T. P. Ramamoorthy

ANCISTROCLADUS Wallich *nom. cons.*

Usually climbing shrubs. Leaves alternate, estipulate, sessile, entire, strongly 1-nerved, often with numerous gland pits. Inflorescence

a dichotomously branching, axillary to subterminal panicle. Flowers bisexual, regular; pedicel strongly articulate. Sepals 5, imbricate, adnate to ovary, accrescent, often gland-pitted. Petals 5, free, contorted or imbricate. Stamens usually 9-10, all fertile or some staminodial; filaments dilated below and connate; anther 2-celled, usually introrse, basifixed. Ovary half-inferior, 1-locular; ovule 1, pendulous; styles 3; stigmas flattened. Fruit a nut, adnate to the accrescent calyx.

Ancistrocladus heyneanus Wall. ex Graham, Cat. Pl. Bombay 28. 1839; Wight, Ic. t. 1987-8. 1853; Gamble, Fl. Madras 86(62). 1915.

Large climbing shrubs with hooked branches. Leaves usually crowded, to 46×16 cm, oblanceolate, gland-pitted. Stamens 9-10.

South W. India. Common in semi-evergreen forests of lower Ghats, toward stream. March-April. *CJS* 16685, *HFP* 2723.

Note: In the only flower of one collection (*CJS* 16527) from lower Bisle Ghat, 4 of the 9 stamens were found reduced to staminodes. This could be *A. hamatus* (Vahl) Gilg of Sri Lanka (with 5 stamens). If these two taxa are not different, *A. hamatus* will have the priorable basionym.

47. BEGONIACEAE

T. P. Ramamoorthy

BEGONIA Linnaeus

Caulescent or acaulescent herbs, sometimes with subterranean tuber, often succulent, erect or creeping and ascending. Leaves alternate; stipules 2, deciduous; blade crenate-serrate, often oblique at base, palmately veined. Inflorescence cymose, dichotomously branching, sometimes collected into thyrsoid panicles, generally axillary. Flowers polygamo-dioecious, bracteolate or not, regular or irregular. Staminate flower: tepals 2-6, upto 10, equal or unequal, free or connate, valvate or imbricate, the outer ones often petaloid. Stamens many; filaments free or connate below; anther 2-celled, poricidal or dehiscing longitudinally. Pistillate flower: tepals 2-8. Ovary inferior, 1-3-winged or ribbed, 1-3, sometimes to 6-locular; ovules numerous, axile; placentas sometimes branching; styles 2-6; stigmas thick, spreading and branching, densely papillose. Fruit a loculicidal capsule, sometimes irregular or apical, rarely indehiscent, usually 3-winged, many-seeded.

1 Plant with subterranean tuber; perianth 2-seriate.....*B. integrifolia*
1 Plant without subterranean tuber; perianth 1-seriate.....*B. malabarica*

Begonia integrifolia Dalzell, Hooker's J. Bot. Kew Gard. Misc. 3: 230. 1851; Gamble, Fl. Madras 546(385). 1919.

Fig. 35. BEGONIACEAE. *A. Begonia integrifolia*: habit; *Aa*, male flower; *Ab*, anther; *Ac*, female flower; *Ad*, gynoecium; *Ae*, same, cross-section. *B. Begonia malabarica*: female flower; *Ba*, male flower; *Bb*, fruit.

Subacaulescent herbs with subterranean tuber. Leaves to 17×17 cm, orbicular, acute at tip, cordate and oblique at base, glabrous. Tepals 4, petaloid and pink in male, the outer two smaller. In female 6, inner ones gradually smaller, veined, white. Ovary 2-locular; styles 2; stigmas branching, papillose. Dorsal wing of capsule larger.

South W. India. Common on wet rock surfaces, in dense semi-evergreen forests in lower Ghats. July-September. *HFP* 426, 2214.

Begonia malabarica Lam., Encycl. 1: 393. 1785; Gamble, Fl. Madras 546(386). 1919. *Diploclinium lindleyanum* Wight, Ic. t. 1817. 1852.

Caulescent perennials. Leaves to 16×5 cm, lanceolate, acute, serrate, cordate and oblique at base, sparsely hairy. Tepals 2 in both sexes. Ovary 3-locular; styles 3; stigmas many-branched. Capsule wings equal.

South W. India. Frequent in dense shade near streams and mountain torrents, in Ghats. All seasons. *CJS* 16814, *HFP* 1881.

48. CUCURBITACEAE

K. N. Gandhi

Prostrate or climbing, monoecious or dioecious herbs, rarely shrubs, with watery juice, usually bearing spirally twisted tendrils. Leaves alternate; stipules apparently 0; blade simple, entire, variously lobed or rarely compound. Venation palmate or subpalmate. Inflorescence an axillary raceme, umbel, fascicle, panicle or of solitary flowers; bracts present or absent. Flowers unisexual, with hypanthium in pistillate flower. Calyx gamosepalous, 5-toothed to partite. Petals 5, inserted on the limb of calyx, connate or almost free. Stamens basically 5 and 2-thecous or generally 3, all 2-thecous or one 1-thecous; anthers free or cohering, cells straight, arcuate or sigmoid. Staminode or pistillode present or absent. Ovary inferior, adnate to hypanthium tube, usually 1-locular, sometimes few to many-locular by intrusion of placentas, mostly with 3 vertical placentas bearing few-many ovules; style 1, rarely 3; stigmas commonly 3, entire or lobed. Fruit a berry with dry or fleshy pericarp, sometimes dehiscent; seeds often compressed.

1 Petals fimbriate.....**Trichosanthes**
1 Petals entire.
2 Tendril branched.....**Diplocyclos**
2 Tendril simple.
3 Calyx tube closed near attachment of stamens by 2-3 incurved scales; male peduncle with spathaceous bract.....**Momordica**
3 Calyx tube not closed; bracts not spathaceous.
4 Anthers sigmoid.
5 Anthers weakly sigmoid; seeds turgid.....**Solena**
5 Anthers strongly sigmoid; seeds compressed.....**Cucumis**

Fig. 36. CUCURBITACEAE. *A. Diplocyclos palmatus*: flowering branch; *Aa*, stamen with sigmoid anthers; *Ab*, transverse section of ovary. *B. Zehneria maysorensis*: flower; *Ba*, *Bb*, stamens with arcuate anthers. *C. Solena amplexicaulis*: vertical section of flower. *D. Cucumis prophetarum*: fruit.

4 Anthers arcuate or straight.
6 Stamens 3, all 2-thecous; anthers arcuate.....**Zehneria**
6 Stamens 3, one 1-thecous, two 2-thecous; anthers straight.....**Mukia**

CUCUMIS Linnaeus

Creeping or climbing, hispid or scabrid, monoecious or dioecious herbs. Tendrils simple. Leaves angular or lobed, dentate, cordate. Flowers clustered or solitary. Calyx campanulate; lobes subulate. Corolla rotate or campanulate, 5-partite; segments oblong or ovate, acute. Stamens 3, inserted at the base of calyx, free, one 1-thecous, two 2-thecous; anther cells sigmoid, connective produced into a glandular crest. Pistillode glandular. Staminodes 3, setiform or ligulate. Ovary ovoid or globose, with many, horizontal ovules; style surrounded by an annular disc; stigmas 3-5. Berry polymorphous, smooth, echinate or spinous; seeds compressed, smooth.

1 Leaves deeply lobed. Ovary villous; fruit smooth.....*C. callosus*
1 Leaves angled or shallowly lobed. Ovary & fruit echinate.....*C. prophetarum*

Cucumis callosus (Rottler) Cogn. in Engl., Pflanzenr. 88: 129. 1924; Chakravarty, Monogr. Indian Cucur. 100. 1959. *Bryonia callosa* Rottler, Ges. Naturf. Freunde Berlin Neue schriften 4: 210. 1803 ('*collosa*'). *Cucumis trigonus* Roxb., Fl. Ind. 3: 722. 1832; Wight, Ic. t. 497. 1841; Gamble, Fl. Madras 535(378). 1919.

Perennial, prostrate, slender, monoecious herbs. Leaves triangular-ovate, 3-7-lobed, to 9×8 cm, scabrid. Flowers solitary, small. Corolla yellow. Berry ellipsoid-globose, obscurely trigonous, smooth, glabrescent, to 4×2.2 cm, yellow with age, sometimes with green stripes.

Paleotropics. Collected once in flower and fruit near Arsikere (dry plain) on 19 December 1968. *CJS* 11965.

Cucumis prophetarum L. in Juslenius, Cent. 1 Pl. 32. 1755; Gamble, Fl. Madras 535(378). 1919; Chakravarty, Monogr. Indian Cucur. 109. 1959.

Perennial, prostrate or climbing, monoecious herbs. Leaves ovate, angled, to 15×13 cm, scabrid. Flowers small; staminate ones usually fascicled; pistillate ones solitary. Corolla yellow. Berry ellipsoid, echinate, green with white stripes, to 4.5×3 cm.

Paleotropics. Common trailers in upper Ghats. August-November. *CJS* 11233, 14724.

Note: Cucumis melo L. The 'Melon'. Annual. Fruits polymorphous, smooth, used as vegetables (raw) and as table fruits (when ripened). Cultivated on sandy beds of rivers. *Cucumis sativus* L. The 'cucumber'. Annual. Fruits cylindric, obscurely tubercled, smooth with age, yellowish-green, used as vegetable. Commonly cultivated in gardens.

DIPLOCYCLOS (Endlicher) von Post & Kuntze

Climbing monoecious herbs. Tendrils 2-fid. Leaves usually palmately lobed. Inflorescence a raceme, fascicle or flowers solitary; staminate and pistillate flowers sometimes coaxillary. Calyx campanulate; lobes subulate. Corolla campanulate, deeply partite; segments ovate. Stamens 3, inserted at the base of calyx tube, one 1-thecous, two 2-thecous; anthers cohering, cells sigmoid, connective not produced. Pistillode 0. Staminodes 3. Ovary ovoid or globose with few horizontal ovules; style naked at base; stigmas 3, bilobed, papillose. Berry ovoid-conical, pulpy, smooth; seeds belted at middle.

Diplocyclos palmatus (L.) Jeffrey, Kew Bull. 15: 352. 1962. *Bryonia palmata* L., Sp. Pl. 1012. 1753, excl. syn. *Bryonia laciniosa* sensu Wight, Ic. t. 500. 1841. *Bryonopsis laciniosa* auct. non (L.) Naudin: Gamble, Fl. Madras 534(377). 1919; Chakravarty, Monogr. Indian Cucur. 135. 1959.

Tuberous, slender herbs. Leaves to 15×12 cm; lobes sometimes pinnatifid, remotely toothed. Flowers fascicled, small, greenish-yellow. Berry ovoid, 2-3 cm across, brick red, with white lines.

Paleotropics. Occasional in upper Ghats. August-December. *CJS* 10181, 11489.

Note: The type of *Bryonia laciniosa* L. is *Cayaponia laciniosa* (L.) Jeff. until recently known as *Cayaponia racemosa.*

MOMORDICA Linnaeus

Climbing or creeping, monoecious or dioecious herbs. Tendrils simple or bifid. Leaves variously lobed. Flower peduncle often bracteate. Calyx campanulate; tube closed at base by 2-3, incurved scales; lobes ovate-lanceolate. Corolla rotate-campanulate, deeply partite; segments oblong or obovate. Stamens 2-3, free, inserted at the mouth of calyx, one 1-thecous, other 2-thecous; anther cells sigmoid. Pistillode glandular or 0. Staminodes of 2-3 glands or 0. Ovary oblong with many horizontal ovules; style naked at base; stigmas 3, entire or lobed. Fruit a berry or 3-valved capsule; seeds smooth or sculptured.

Momordica dioica Roxb. ex Willd., Sp. Pl. 4: 605. 1805; Wight, Ic. t. 505, 506. 1841; Gamble, Fl. Madras 532(375). 1919; Chakravarty, Monogr. Indian Cucur. 91. 1959.

Tuberous-rooted, dioecious climbers. Tendrils simple. Petiole eglandular; leaf blade ovate, 3-5-lobed, cordate, to 10×6 cm. Flowers solitary; male peduncle to 10 cm, with spathaceous bract at apex. Calyx lobes linear-lanceolate, acute. Corolla yellow. Fruit ovoid, rostrate at apex, 3-5×2 cm, orange-colored, muricate, edible.

Indomalaysia. Occasional in upper Ghats. August-October. *CJS* 14554, *HFP* 510.

Note: *Momordica charantia* L. Monoecious climbers. Peduncles bracteate at middle or base. Fruits fusiform, rostrate, tubercled, greenish-yellow or orange, bitter, used as vegetables and valued for medicinal virtues. Cultivated in gardens and also run wild.

MUKIA Arnott

Scandent or decumbent herbs. Tendrils simple. Leaves lobed, cordate. Flowers fascicled. Calyx campanulate, shortly 5-lobed. Corolla deeply partite. Stamens 3, free, inserted at the base of calyx, one 1-thecous, two 2-thecous; anther cells straight, connective often produced. Pistillode small. Staminodes 3 or 0. Ovary ovoid, hispid, with numerous horizontal ovules; style surrounded by an annular disc at base; stigmas 2-3, papillose. Berry globose, smooth; seeds turgid, often scrobiculate, margined.

Mukia maderaspatana (L.) Roemer, Syn. Pep. 47. 1846; Sant., Fl. Khandala ed. 3, 104. 1967. *Cucumis maderaspatanus* L., Sp. Pl. 1012. 1753. *Bryonia scabrella* L. f., Suppl. 424. 1781; Wight, Ic. t. 501. 1841. *Mukia scabrella* (L. f.) Arn., J. Bot. (Hooker) 3: 276. 1841; C. B. Clarke in J. Hooker, Fl. Brit. India 2: 623. 1873. *Melothria maderaspatana* (L.) Cogn. in A. & C. DC., Monogr. Phan. 3: 623. 1881; Gamble, Fl. Madras 539(381). 1919; Chakravarty, Monog. Indian Cucur. 141. 1959.

Leaves serrate, ovate, acute, to 7×6 cm, scabrous. Flowers small. Corolla yellow. Staminal filaments pilose, short; connective apiculate. Berry 1 cm across, short-pedicelled, red with age.

Paleotropics. Occasional across the District. July-October. *CJS* 14624, 15239.

Note: Many authors describe this taxon as monoecious but our collections have pistillate flowers or fruits and lack staminate flowers.

SOLENA Loureiro

Slender climbers. Tendrils simple. Leaves often lobed, cordate or sagittate. Inflorescence racemose, umbellate or flowers solitary. Calyx campanulate-tubular, 5-toothed. Corolla deeply partite. Stamens 3, free, inserted at the base of calyx, one 1-thecous, two 2-thecous; anther cells weakly sigmoid, connective produced or not. Pistillode trilobed. Staminodes 3. Ovary ovoid, with numerous horizontal ovules; style surrounded by a cupular disc at base; stigmas 3. Berry smooth; seeds turgid.

Solena amplexicaulis (Lam.) Gandhi *comb. nov.* *Bryonia amplexicaulis* Lam., Encycl. 1: 496. 1785; Wight, Ic. t. 502. 1841. *Melothria amplexicaulis* (Lam.) Cogn. in A. & C. DC., Monogr. Phan. 3: 621. 1881; Gamble, Fl. Madras 539(380). 1919; Chakravarty, Monogr. Indian Cucur. 146. 1959.

Dioecious. Leaves remotely denticulate, ovate, obtuse-acuminate, clasping at base, to 9×5 cm, slightly scabrous, membranous. Staminate flowers in a short corymb. Pistillate flowers solitary. Corolla creamy-white. Staminal filaments distinct, glabrous; connective produced. Berry oblong, ribbed, 2-3 cm long.

South India. Occasional in western plain and upper Ghats. March-October. *CJS* 14153, *HFP* 1802.

TRICHOSANTHES Linnaeus

Dioecious or monoecious climbers. Tendrils simple or 2-5-fid. Leaves entire or lobed, denticulate. Inflorescence racemose or flowers solitary; peduncles often in pairs, one 1-flowered and frequently caducous, other racemose, distinctly bracteate. Calyx tubular, widened upwards; lobes entire-laciniate. Petals connate at base, fimbriate along the margin. Stamens 3, inserted at the base of calyx, one 1-thecous, two 2-thecous; anthers cohering, sigmoid; connective not produced. Ovary ovoid or globose, with numerous, horizontal ovules; style long, slender; stigmas 3, entire or bifid. Berry smooth, fleshy; seeds marginate, smooth.

1 Leaves entire..... *T. nervifolia*
1 Leaves angled or lobed.
2 Bracts minute or 0. Leaves smooth..... *T. perrottetiana*
2 Raceme bracteate. Leaves scabrid or hispid..... *T. bracteata*

Trichosanthes bracteata (Lam.) Voigt, Cat. Hort. Calc. 58. 1845; Chakravarty, Monogr. Indian Cucur. 44. 1959. *Modecca bracteata* Lam., Encycl. 4: 210. 1797. *Trichosanthes palmata* Roxb., Fl. Ind. 3: 704. 1832; Gamble, Fl. Madras 529(374). 1919.

Leaves usually palmately lobed, broadly ovate, cordate, to 16×13 cm, scabrid or hispid above, lobes usually acute-acuminate, apiculate. Racemed flowers with spathaceous laciniate bracts; solitary flowers ebracteate or minutely bracteate. Calyx tube 4-6 cm long; lobes linear-oblong, entire-laciniate. Corolla white. Berry 6 cm across, red with age; seeds turgid, tapered at base.

Indomalaysia. Frequent in semi-evergreen to wet deciduous forests, in Ghats. May-October. *CJS* 11468, 14335.

Note: Some authors (Gamble, *l. c.*, Chakravarty, *l. c.*) characterize *T. bracteata* with ebracteate pistillate flowers and *T. anamalaiensis* with bracteate pistillate flowers but, in our collections solitary pistillate flowers are minutely bracteate or ebracteate while racemed pistillate flowers are distinctly bracteate. Study of the type is needed.

Of several collections of *T. bracteata* made, two of them are distinct as follows:

HFP 1840: Leaves deeply palmately lobed, with lobes obscurely denticulate, obtuse although apiculate; raceme short peduncled; calyx tube short with ovate-lanceolate, shortly dentate lobes. Dry deciduous forest near Byra (flowering in July).

CJS 14125: Leaves deeply palmately lobed, subcordate, with sub-pinnatifid segments (4 mm across) and thus resembles *T. palmata* var. *laciniosa* C. B. Clarke (*Fl. Brit. India* 2: 607. 1873). Scrub near Nagpuri (flowering in July).

We consider these as extreme forms of *T. bracteata* living in unusually dry habitats.

Trichosanthes nervifolia L., Sp. Pl. 1008. 1753; Gamble, Fl. Madras 529(373). 1919: Chakravarty, Monogr. Indian Cucur. 30. 1959.

Leaves entire, ovate, acuminate, cordate, to 12×6 cm, membranous. Staminate flowers in a raceme; pistillate flowers solitary; bracts minute or 0. Calyx tube 5-6 cm long; lobes linear. Corolla white. Berry ellipsoid, apiculate, to 6×4 cm, yellow-orange-red; seeds ellipsoid, compressed.

South India, Sri Lanka. Locally common in semi-evergreen forests of lower Shiradi Ghat and occasional in wet deciduous forests of upper Bisle Ghat. June-December. *CJS* 11437, 15852.

Trichosanthes perrottetiana Cogn. in A. & C. DC., Monogr. Phan. 3: 362. 1881; Gamble, Fl. Madras 529(373). 1919; Chakravarty, Monogr. Indian Cucur. 38. 1959.

Glabrous herbs. Leaves ovate, 3-lobed above the middle, cordate, to 10×8 cm, membranous. Pistillate flower solitary; bracts minute, caducous; pedicel 2 cm long; calyx tube 3.5 cm long; lobes linear. Corolla white.

South India. Collected once in flower (pistillate) from semi-evergreen forest of Kempuhole (lower Shiradi Ghat) on 13 April 1971. *HFP* 1542.

Note: *Trichosanthes anguina* L., the Snake-Gourd is commonly cultivated in gardens for fruits which are used as a vegetable.

ZEHNERIA Endlicher

Monoecious or dioecious climbers. Tendrils simple. Leaves cordate. Inflorescence an umbel, raceme, fascicle or of solitary flowers. Calyx campanulate, 5-toothed. Corolla 5-partite. Stamens 3, free, each 2-thecous, inserted at the throat or base of calyx tube; anther cells arcuate; connective not produced. Pistillode often 3-lobed. Staminodes 3. Ovary with few-many horizontal ovules; style surrounded by cupular disc; stigmas 3. Berry ovoid or globose; seeds often compressed.

Zehneria maysorensis (Wight & Arn.) Arn., J. Bot. (Hooker) 3: 275. 1841; Jeffrey, Kew Bull. 15: 366. 1962. *Bryonia maysorensis* Wight & Arn., Prodr. 345. 1834. *Melothria perpusilla* var. *subtruncata* Cogn. in A. & C. DC., Monogr. Phan. 3: 606. 1881; Gamble, Fl. Madras 528 (380). 1919. *Melothria perpusilla* auct. non (Blume) Cogn.: Gamble, *l. c.*; Chakravarty, Monogr. Indian Cucur. 146. 1959.

Monoecious. Leaves remotely serrate, ovate, suborbicular or oblong, simple to 3-7-lobed, to 9×7 cm, often hispid beneath, membranous. Flowers subumbellate or pistillate flowers solitary, subsessile; sometimes staminate and pistillate flowers coaxillary. Corolla white. Stamens inserted at the base of calyx; filaments pilose. Berry 1 cm across, smooth with age; seeds smooth, apiculate.

Indomalaysia. Occasional in undergrowth in wet deciduous forests of upper Ghats. All seasons. *CJS* 10015, 14614.

Note: Jeffrey (*Kew Bull.* 15: 370-71. 1962) comments that three taxa have been confused, *Z. mucronata, Z. scabra* and *Z. maysorensis,* the latter two in India. *Z. scabra* is dioecious; *Z. maysorensis* is monoecious.

* * *

The following are commonly cultivated:

Citrullus lanatus (Thunb.) Mansf. (incl. *Citrullus vulgaris* Schrader). The water melon. Leaves triangular in outline, bipinnatifid. Flowers yellow. Berry fleshy, oblong, large. Adams (*Fl. Pl. Jamaica* 50. 1972) credits this binomial to (Thunb.) Masum. & Nakai.

Cucurbita maxima Duch. ex Lam. The Squash-Gourd. Flowers solitary, long-peduncled. Corolla yellow. Berry fleshy, large.

Cucurbita pepo DC. The Pumpkin. Corolla yellow. Fruits of various sizes, with fibrous pulp.

Lagenaria siceraria (Molina) Standley (*L. vulgaris* Seringe). The Bottle Gourd. Petiole glandular at apex. Fruits of various shapes and sizes with hard, durable, smooth shell.

49. SALICACEAE

K. N. Gandhi

SALIX Linnaeus

Dioecious shrubs or trees. Leaves alternate; stipules usually caducous; blade simple. Inflorescence a simple catkin. Flowers unisexual, sessile, subtended by a caducous bract. Perianth 0. Disc a simple or bifid scale. Stamens 2-many; filaments variously connate. Ovary superior, stipitate, 1-locular; ovules 4-8, sub-basal, amidst a mass of hairs; style short, 2-4-fid. Fruit a 2-valved capsule; seeds comose.

Fig. 37. SALICACEAE. *A. Salix tetrasperma:* staminate flowering branch; *Aa*, staminate flower; *Ab*, pistillate flowering branch, *Ac*, pistillate flower; *Ad*, same, vertical section.

Salix tetrasperma Roxb., Pl. Cor. t. 97. 1795; Wight, Ic. t. 1954. 1853; Bedd., Fl. Sylv. t. 302. 1873; Gamble, Fl. Madras 1389(973). 1928.

Small deciduous trees; young parts glabrous to silvery-tomentose. Leaf blade glandular-serrate, narrowly elliptic-lanceolate, to 15×3.5 cm, glabrescent, sometimes glaucous beneath, membranous. Peduncle 3-12 cm long. Stamens 4-12, free, villous at base. Ovary glabrous.

Indomalaysia. Occasional along water courses. September-December. *CJS* 15238, *HFP* 1192.

50. CAPPARACEAE

T. P. Ramamoorthy

Herbs, shrubs or trees. Leaves alternate; stipules minute or spinous, sometimes wanting; blade simple or palmately lobed, entire, penninerved. Inflorescence various, bracteate. Flowers bisexual (gynoecium rarely reduced), regular to slightly irregular, pedicelled; bracteoles present. Calyx generally 4, usually free in two whorls of two; the outer usually unlike the inner, imbricate; petals 4, usually equal, often clawed, spreading; receptacle often with glandular outgrowths. Stamens 4-many, free, sometimes their base connate with gynophore; anthers dorsifixed, 2-celled, introrse; dehiscence longitudinal. Ovary superior, sessile or on a gynophore, usually 1-locular; placentas 2-6, parietal, ovules many; stigma simple, subsessile. Fruit a capsule or berry, usually many-seeded.

1 Trees; leaves 3-foliolate.....**Crateva**
1 Herbs or shrubs.
2 Annual herbs.....**Cleome**
2 Shrubs.
3 Plants armed with stipular spines.....**Capparis**
3 Plants unarmed.
4 Receptacle with a posterior, elongate gland; fruit cylindric.....**Cadaba**
4 Receptacle without outgrowths; fruit moniliform.....**Maerua**

CADABA Forskal

Shrubs. Leaves usually simple. Inflorescence usually of terminal racemes. Flowers irregular. Outer 2 sepals larger, concave, valvate. Receptacle with a posterior, stalked gland. Stamens 4-8, basally connate with the gynophore. Ovary on gynophore. Fruit a fleshy, indehiscent berry, eventually dehiscent by 2 valves. Seeds many, globose.

Cadaba fruticosa (L.) Druce, Bot. Exch. Club Soc. Brit. Isles 3: 415. 1914. *Cleome fruticosa* L., Sp. Pl. 671. 1753. *Cadaba indica* Lam.,

Fig. 38. CAPPARACEAE. *A. Maerua arenaria*: flowering twig; *Aa*, fruit. *B. Crateva nurvala*: flower, vertical section; *Ba*, ovary, cross section. *C. Cadaba fruticosa*: flower; *Ca*, fruit. *D. Capparis cleghornii*: flowering branch. *E. Capparis zeylanica*: fruit, vertical section.

Encycl. 1: 544. 1785; Gamble, Fl. Madras 43(31). 1915.

Glandular-pubescent, unarmed shrubs, often scandent. Leaves 3-4×1-2 cm, oblong-obovate, subemarginate, truncate-cordate. Outer sepals acute at tip; petal clawed; limb orbicular, to 0.5 cm broad, white turning yellow. Posterior gland to 8 mm long; stamens 4; gynophore to 2.5 cm long. Fruit 1.5-2 cm long, eventually dehiscing.

South W. India. Common in scrub forests, sometimes on trees or old walls. All seasons. *CJS* 15173, *HFP* 6.

CAPPARIS Linnaeus

Erect or climbing shrubs. Leaves simple; stipules of curved spines. Inflorescence axillary, extra-axillary, various. Flowers bisexual. Outer pair of sepals strongly concave, valvate; inner pair slender. Petals 4, usually clawed; receptacle often with an adaxial gland. Stamens 6-many, free or basally connate with gynophore. Gynophore as long as staminal filaments, tipped by the globose, sometimes beaked ovary. Fruit an indehiscent 1-many-seeded berry with hard rind, usually globose and beaked.

1 Leaf with recurved callus tip.....*C. zeylanica*
1 Leaf without a callus tip.
 2 Flower solitary.
  3 Leaves rounded, less than 2 cm long.....*C. grandiflora*
  3 Leaves linear-lanceolate, more than 3 cm.....*C. divaricata*
 2 Flowers corymbose or in umbels, dense.
  4 Buds glabrous.....*C. sepiaria*
  4 Buds fulvous-tomentose.....*C. cleghornii*

Capparis cleghornii Dunn ex Gamble, Fl. Madras 46(33). 1915; Dunn, Bull. Misc. Inform. 61. 1916; Rao & Raghavan, Blumea 12: 313, f. 1. 1964; Jacobs, Blumea 12: 445. 1965.

Scandent shrubs. Leaves 4-6×2-3 cm, elliptic-oblong, puberulous below. Flowers in terminal corymbs, 6-10-flowered. Sepals subequal, fulvous-tomentose; petals oblong-obovate, hairy at base; stamens many. Gynophore 3.5-4.5 cm long; ovary globose, glabrous. Drupe to 3×2.5 cm, smooth, 1-4-seeded.

Western Ghats in Karnataka. Common, along margin of wet deciduous forests. February-July. *CJS* 16238, *HFP* 89.

Capparis divaricata Lam., Encycl. 1: 606. 1785; Wight, Ic. t. 889. 1844; Jacobs, Blumea 12: 515. 1965. *Capparis stylosa* DC., Prodr. 1: 246. 1824; Gamble, Fl. Madras 45(32). 1915.

Erect shrubs; innovations greyish with stellate hairs, glabrescent early. Leaves 4-4.2×0.4-1 cm, linear-lanceolate, rounded-emarginate. Flowers axillary, solitary. Outer sepals to 1×1.8 cm, carinate; inner to

3×0.6 cm, petaloid. Petals to 3.5×0.6 cm, elliptic-lanceolate, rounded, hairy inside, yellowish. Gynophore 1.5-1.8 cm long. Berry to 4×3.5 cm, apiculate.

South W. India. Locally common in dry rocky-sandy terrain at the foot of hills, in the eastern plains. March-July. *CJS* 16821, *HFP* 383.

Capparis grandiflora Wall. ex J. Hooker & Thoms. in J. Hooker, Fl. Brit. India 1: 174. 1872; Gamble, Fl. Madras 45(32). 1915; Jacobs, Blumea 12: 455. 1965. *Capparis pyrifolia* auct. non. Lam.: Wight & Arn., Prodr. 25. 1834; Wight, Ic. t. 1047. 1846.

Undershrubs. Leaves to 1.8×1 cm, ovate, acute-rounded; midrib impressed beneath and hairy. Flowers solitary, axillary. Outer sepals 1.4×0.6 cm, concave, carinate; inner broadly rounded. Petals to 2.6 cm long, obovate, bright yellow. Gynophore to 2 cm long; ovary globose, ellipsoid; stigma capitate, pilose. Fruit ovoid.

South W. India. Fairly common under trees in dry to wet deciduous forests in the western plains, bordering Coorg. March-April. *CJS* 16486, 16727.

Capparis sepiaria L., Syst. Nat. ed. 10, 2: 1071. 1759; Gamble, Fl. Madras 45(33). 1915; Jacobs, Blumea 12: 489. 1965.

Erect or climbing shrubs. Leaves 2.2-3.5×1-2 cm, ovate-elliptic, acute-emarginate, cuneate. Flowers in umbels, axillary. Outer sepals to 0.5×0.2 cm, ovate, concave; inner broadly rounded. Petals to 0.6×0.2 cm, linear, spatulate, ciliate. Gynophore to 0.8 cm long. Fruit 0.8×0.8 cm.

Tropical Africa to Australia. Common in open scrub. April-July. *CJS* 9705, *HFP* 5.

Capparis zeylanica L., Sp. Pl. ed. 2, 720. 1762; Gamble, Fl. Madras 46(33). 1915; Jacobs, Blumea 12: 505. 1965. *Capparis horrida* L. f., Suppl. 264. 1781; Wight, Ic. t. 173. 1839.

Climbing shrubs. Leaves 5-7.5×2-3.5 cm, ovate-elliptic, cuneate-cordate, with callose apex. Flowers sometimes appearing before leaves, corymbose or racemose. Outer sepals to 1.5×1 cm, ovate, rounded, fulvous-tomentose; inner to 1×0.7 cm, rounded. Petals to 1.5×1 cm, ovate to orbicular. Berry to 5×4 cm.

Indomalaysia. Common in plains on hedges and shrubs. October-August. *CJS* 16337, 16614.

CLEOME Linnaeus

Annual herbs. Leaves simple, entire or 3-9-lobed; stipules 0. Inflorescence various. Flowers bisexual. Petals often clawed; receptacle with a small disc. Stamens 6-many, sometimes basally connate with

the gynophore. Ovary usually on a gynophore. Capsule linear, terete, dehiscing by 2 valves; the placentae persisting. Seeds many, reniform, variously ornamented.

1 Basal leaves undivided; stamens 6.....*C. monophylla*
1 Basal leaves divided; stamens more than 10.....*C. viscosa*

Cleome monophylla L., Sp. Pl. 672. 1753; Gamble, Fl. Madras 41(29). 1915.

Glandular-pubescent herbs. Leaves simple, 3-5×0.7-1.2 cm, ovate-lanceolate, acute-acuminate, subcordate. Petals purple to white. Stamens 6. Capsule to 7 cm long. Seeds tubercled, black.

Tropical Africa. A weed along roadsides and disturbed places in plains. May-August. *CJS* 13762, *HFP* 141.

Cleome viscosa L., Sp. Pl. 672. 1753; Gamble, Fl. Madras 41(29). 1915.

Glandular hairy herbs. Leaves 3-7-lobed, rarely undivided towards tip. Petals yellow; stamens 10-20. Capsule ridged. Seeds brown.

Indomalaysia. Common along roadsides and disturbed places in lower Shiradi Ghat. June-October. *CJS* 13865, *HFP* 339.

CRATEVA Linnaeus

Trees. Leaves 3-foliolate; lateral leaflets usually asymmetrical; stipules small, deciduous. Inflorescence a terminal, corymbose raceme. Flowers bisexual, subtended by deciduous bract. Receptacle with a small disc-like gland. Stamens 10-many, basally connate with gynophore. Gynophore as long as stamens. Ovary glabrous. Berry many-seeded, with a hard rind.

Crateva nurvala Ham., Trans. Linn. Soc. London 15: 121. 1827; Jacobs., Blumea 12: 194. 1964. *Crateva religiosa* auct. non Forster: Gamble, Fl. Madras 47(34). 1915; Bedd., Fl. Sylv. t. 116. 1871.

Trees, deciduous shortly before flowering. Leaflets 11-15×4.5-7 cm, lanceolate, shortly stalked, pale beneath, dark green above. Inflorescence many-flowered. Petals yellow or white; stamens many, red. Berry papillate.

S. Asia, Indomalaysia. Rare. Only one tree on the banks of Kempuhole in semi-evergreen forest, near Shiradi Ghat border. January. *CJS* 12612, 15970.

MAERUA Forskal

Scandent or erect, unarmed shrubs. Leaves simple; stipules 0.

Inflorescence axillary, corymbose-racemose, bracteate. Flowers bisexual; bracteoles 0. Petals free, smaller than calyx; receptacle with an annular disc. Stamens many; filaments basally connate with the gynophore. Berry elongate, moniliform.

Maerua arenaria (DC.) J. Hooker & Thoms. in J. Hooker, Fl. Brit. India 1: 171. 1872; Gamble, Fl. Madras 42(30). 1915. *Niebuhria arenaria* DC., Prodr. 1: 244. 1824.

Scandent shrubs. Leaves 4-6 × 0.5-1.6 cm, linear-lanceolate, glabrous. Corymbs axillary. Sepals to 1.5 × 0.5 cm, oblong, acute, ciliate. Petals linear-spatulate, to 1 cm long.

Western Himalayas, Central and S. India. Rare, collected only once in flower along roadsides, in open country near Channarayapatna although it is abundant in scrub forests in Doddagunihalli near Tiptur, bordering on Hassan District. March-April. *HFP* 1426.

51. BRASSICACEAE

K. N. Gandhi

Herbs, rarely shrubs; sap watery, often pungent. Leaves radical and/or cauline; stipules 0; blade simple or compound; venation pinnate. Inflorescence an axillary, terminal or subscapose raceme; bracts 0. Flowers bisexual, usually regular. Sepals 4, free, imbricate, outer 2 often pouched at base. Petals 4, free, imbricate, clawed, sometimes absent. Stamens 6, free, outer 2 smaller (tetradynamous), rarely fewer; anthers 2-celled. Disc of 4 glands, opposite to sepals. Ovary superior, stipitate, 1-locular or spuriously 2-locular, with few-many parietal ovules; style present or absent; stigma capitate, entire or 2-lobed. Fruit linear and longer than broad (silique) or short and broader than long (silicle), usually dehiscent, leaving the persistent false septum (replum); seeds usually 1-seriate.

1 Leaves cauline. Ovary and fruits longer than broad.....**Brassica**
1 Leaves radical and cauline. Ovary and fruits broader than long.....**Coronopus**

BRASSICA Linnaeus

Herbs with a woody root-stock. Leaves alternate, simple, pinnatifid or lyrate, rarely entire, membranous. Racemes axillary and terminal, short or long. Sepals erect or spreading. Ovary linear, cylindrical or angled, few-many-ovuled; stigma entire or 2-lobed. Fruit (silique) 2-valved, many-seeded; beak generally empty.

Brassica juncea (L.) Czernajew, Consp. Pl. Chark. 8. 1859; Gamble, Fl. Madras 38(28). 1915; Backer & Bakh. f., Fl. Java 1: 189. 1963;

Tutin et al., Fl. Europaea 1: 337. 1964. *Sinapis juncea* L., Sp. Pl. 668. 1753.

Glabrous, erect, branched herbs. Lower leaves petiolate, often lyrate 4-7×2.5-4 cm, upper ones more or less sessile, entire, smaller. Raceme short, many-flowered. Flowers yellow. Sepals spreading. Anthers oblong. Stigma truncate. Capsule with an empty beak; valves 3-ribbed.

Cultivated in Paleotropics. Collected once in flower along a road at Yethinahalla (upper Shiradi Ghat) on August 5, 1970. *HFP* 401.

Note: Some authors (Bailey, *Man. Cult. Pl.* 438. 1949; Index Kew.) attribute the binomial *B. juncea* to Cosson (*Bull. Soc. Bot. France* 6: 609. 1859).

CORONOPUS Zinn *nom. cons.*

Annual herbs. Leaves simple and/or compound. Racemes leaf-opposed. Sepals spreading. Stamens perfect or some sterile. Ovary short, round, 2-locular; locules 1-ovuled; style short or 0; stigma truncate. Fruits of 2 indehiscent, 1-seeded valves, broader than long (silicle).

Coronopus didymus (L.) J. E. Sm., Fl. Brit. 2: 691. 1800; Maheshwari, Fl. Delhi 57. 1962; Stewart, Annot. Cat. Pl. Pakistan 306. 1972. *Lepidium didymum* L., Mant. 92. 1767. *Senebiera didyma* (L.) Pers., Syn. 2: 185. 1807; Gamble, Fl. Madras 39(28). 1915.

Small, pubescent herbs. Radical leaves pinnate, 6-8 cm long, pinnae incised; cauline leaves pinnatifid, small. Raceme 1-2.5 cm long. Flowers greenish-white; pedicels filiform, 4-5 mm long. Fertile stamens 2, other staminodial. Fruits to 1.8×2.5 mm, emarginate.

Probably from S. America. Weed collected once in flower and fruit at Arkalgud (plain) on July 5, 1971. *HFP* 1834.

52. ERICACEAE

T. P. Ramamoorthy

VACCINIUM Linnaeus

Woody. Leaves alternate, simple, pinnately veined, estipulate. Bracts sometimes foliaceous, subpersistent. Flowers bisexual, pedicelled. Sepals 5, united more than half their length, imbricate. Corolla urceolate, 5-toothed, imbricate; disc 5-lobed. Stamens 10; anther cells appendaged, poricidal; connectives often produced into cilia. Ovary inferior, 5-locular; ovules many, on axile intruding placentas; style simple; stigma 5-lobed. Fruit a berry.

Fig. 39. ERICACEAE. *A. Vaccinium neilgherrense*: flowering twig; *Aa*, flower
Ab, vertical section of same; *Ac*, transverse section of ovary; *Ad*, stamen;
Ae, same, rear view; *Af*, fruit.

Vaccinium neilgherrense Wight, Ic. t. 1189. 1848; Gamble, Fl. Madras 741(521). 1921.

Small trees. Leaves alternate, to 6×9 cm, elliptic-lanceolate, acuminate at tip, narrowed and subsessile below, crenate-serrate; midrib glandular beneath on vein axils. Inflorescence axillary, racemose. Flowers white, pubescent, to 0.8 cm long. Calyx persistent. Corolla lobes reflexed at anthesis. Anther cells with apical tubules and basally verrucose; connectives ciliate. Berry globular, 1 cm across. Seeds many.

South W. India. Local in distribution, in wet deciduous forests along Jayaparvathi river near Devarunde. January-October. *CJS* 15266, *HFP* 2673, 2769.

53. SAPOTACEAE

T. P. Ramamoorthy

Usually lactiferous trees. Leaves alternate, generally estipulate, simple, entire, pinnately veined. Inflorescence of fascicles, rarely flowers solitary. Flowers bisexual, regular. Calyx in 1-2 series, 4-8-lobed, the outer usually valvate, the inner imbricate; petals as many as calyx lobes, sometimes twice as many, sometimes more, occasionally with petaloid appendages on their back, fused below. Stamens as many as and opposite petals, generally more, 2-many-seriate, inserted on the corolla tube; anthers 2-celled, dehiscing longitudinally; staminodes when present alternating with stamens. Ovary superior, 3-8-locular, sometimes more; ovule 1 in each locule, axile; style elongate; stigma indistinct. Fruit 1-few-seeded berry; seeds compressed.

1 Sepals uniseriate, 5-6; stamens 5-6.
2 Leaves with numerous close, parallel secondary veins.....**Chrysophyllum**
2 Leaves with the secondary veins distant.....**Xantolis**
1 Sepals in 2 series, 4-8; stamens 8 or more.
3 Sepals 8; petals with bifid petaloid appendages on back.....**Mimusops**
3 Sepals 4; petals without appendages.
4 Stamens 8.....**Isonandra**
4 Stamens 16-more.....**Madhuca**

CHRYSOPHYLLUM Linnaeus

Leaves with many parallel secondary veins. Inflorescence axillary. Calyx usually 5-6-lobed; corolla lobes as many, shorter or longer than tube. Stamens as many as corolla lobes. Ovary villous, with 5-more locules; ovules placed in the upper part of locules. Berry rounded, pulpy.

Fig. 40. SAPOTACEAE. *A. Chrysophyllum roxburghii*: flowering twig; *Aa*, dissected floral whorls; *Ab*, fruit. *B. Mimusops elengi*: dissected floral whorls. *C. Isonandra stocksii*: vertical section of flower. *D. Xantolis tomentosa*: flower.

Chrysophyllum roxburghii G. Don, Gen. Syst. 4: 33. 1838; Bedd., Fl. Sylv. t. 236. 1873; Gamble, Fl. Madras 757(533). 1921.

Tall evergreen trees. Leaves 10-18×3-6 cm, lanceolate; young twigs and midrib beneath rufous-hairy. Flowers stalked, 0.3-0.4 cm across. Sepals fleshy, orbicular, concave; petals white, orbicular. Berry 2.5-3 cm across.

Indomalaysia. Common in upper Bisle Ghat, in wet deciduous or semi-evergreen forests. January-May. *CJS* 12547, 16857, *HFP* 111.

ISONANDRA Wight

Leaves with secondary nerves distant. Inflorescence axillary. Flowers subsessile or shortly pedicelled. Sepals 4-8, biseriate; corolla 4-8-lobed. Stamens 8-10, uniseriate; staminodes none. Ovary ovate, hirsute, 4-5-locular; style elongate. Berry fleshy.

Isonandra stocksii C. B. Clarke in J. Hooker, Fl. Brit. India 3: 539. 1882; Gamble, Fl. Madras 761(535). 1921; Jeuken, Blumea 6: 570. 1952.

Small tree. Leaves 5-9×2-4 cm, elliptic, sometimes more or less obovate, acute to rounded, truncate-subcordate below. Flowers subsessile. Sepals 4, ovate-acuminate; corolla 8-lobed. Stamens 8; staminal filaments dilated below. Ovary 4-locular.

South W. India. Rare. Collected only once from wet-deciduous forests at Banagare, bordering Coorg District, in upper Bisle Ghat. April. *HFP*1550.

MADHUCA Gmelin

Stipules deciduous. Flowers long-stalked. Sepals 4, biseriate; outer valvate, thicker; inner thinner, imbricate. Corolla generally 8-lobed, 1-few-seriate. Stamens 16-more, in 2-3 whorls; staminodes 0. Ovary usually hairy, 8-more-locular; style persistent. Berry ovoid.

1 Flower and fruit tomentose.....*M. longifolia*
1 Flower and fruit glabrescent or glabrous.....*M. neriifolia*

Madhuca longifolia (Koenig) Macbride, Contr. Gray Herb. Harv. Univ. NS 53: 17. 1918; Royen, Blumea 10:53. 1960. *Bassia longifolia* Koenig in L., Mant. Alt. App. 563. 1771. *Madhuca indica* J. F. Gmelin, Syst. Nat. 799. 1791.

Small deciduous trees. Leaves 7-14×5-7.5 cm, broadly elliptic, rounded at both ends, sometimes subcordate at base. Pedicels tomentose. Sepals ovate, acuminate, pubescent. Corolla white; lobes ovate, acu-

minate. Stamens 20. Berry acuminate, pubescent. Corolla white; lobes ovate, acuminate. Stamens 20. Berry fleshy, brown-tomentose.

Throughout India, Burma. Common in plains and upper Ghats, in open country and roadsides. January-May. *CJS* 12401, 13435.

Note: Royen (*l. c.*) recognizes 2 varieties—var. *longifolia* and var. *latifolia* (Roxb.) Chevalier, the latter based on *Bassia latifolia* Roxb., Pl. Cor. t. 19. 1795.

Madhuca neriifolia (Moon) H. J. Lam, Bull. Bot. Buitenzorg ser. 3, 7: 182, 265. 1925; Royen, Blumea 10: 98. 1960. *Bassia neriifolia* Moon, Cat. Pl. Ceylon 36. 1824. *Bassia malabarica* Bedd., For. Man. 140. 1870; Gamble, Fl. Madras 764(537). 1921.

Small evergreen trees. Leaves 7-20×3-4.5 cm, linear-oblong, sometimes obovate, rounded at both ends. Pedicels glabrous. Sepals ovate, acute, glabrescent. Corolla white; lobes rounded. Stamens 16. Berry fleshy, glabrous.

India, Sri Lanka. Common along streams and banks of rivers in lower Ghats. November-March. *CJS* 11503, 12956.

MIMUSOPS Linnaeus

Evergreen trees. Inflorescence usually axillary, of clusters or solitary flowers. Flowers stalked. Sepals biseriate; corolla 8-lobed; lobes with bifid petaloid appendages on back. Stamens 8, alternating with 8 staminodes. Ovary pubescent, 8-locular; style elongate. Berry fleshy.

Mimusops elengi L., Sp. Pl. 349. 1753; Wight, Ic. t. 1586. 1850; Gamble, Fl. Madras 765(538). 1921.

Medium evergreen trees. Leaves 7-12×3.5-5.5 cm, elliptic, ovate-lanceolate, often abruptly acute, subcordate. Flowers white. Staminodes ovate, acute, hairy on the back. Fruit elliptic, to 3×2 cm, edible.

Indomalaysia. Common in upper Ghats. Usually cultivated in the tropics. April-September. *CJS* 13496, 16156, *HFP* 1578.

Note: *Xantolis tomentosa* (Roxb.) Raf., with uniseriate calyx and corolla and 5 stamens alternating with petaloid staminodes can be expected in the District. It has been collected from across the border, in Chickmagalur. *CJS* 16907.

54. EBENACEAE

C. J. Saldanha

DIOSPYROS Linnaeus

Shrubs or trees. Leaves alternate, estipulate, simple, entire, usually coriaceous, pinnately veined. Inflorescence often axillary. Flowers regular, usually unisexual, 3-5-merous. Calyx gamosepalous, persistent

and accrescent in bisexual and pistillate flowers, deciduous in staminate. Corolla gamopetalous, often urceolate, imbricate. Stamens usually multiples of corolla lobes, sometimes in clusters. Ovary superior, 2-10-locular; ovules 1, rarely 2 in each locule, axile, pendulous; styles very short, 1-5. Fruit usually a globose berry, 1-many-seeded.

1 Flowers 3-merous; ovary 3-locular.....*D. nigrescens*
1 Flowers 4-5-merous; ovary 4-10-locular.
2 Leaves completely glabrous.
3 Male flowers in sessile, rounded fascicles.....*D. candolleana*
3 Male flowers not in rounded fascicles.
4 Fruiting calyx forming woody cup with 4 reflexed-lobes.....*D. sylvatica*
4 Fruiting calyx not forming woody cup; lobes 5.....*D. crumenata*
2 Leaves pubescent or hirsute.
5 Venation indistinct; hairs yellowish.....*D. buxifolia*
5 Venation distinct; hairs not yellowish.
6 Plant hirsute on twigs, petioles and under-surface of leaves.....*D. pruriens*
6 Plant not hirsute; leaves pubescent.
7 Sepals of fruiting calyx with recurved margins. Anthers not awned.....*D. melanoxylon*
7 Sepals of fruiting calyx flat. Anthers awned.....*D. montana*

Diospyros buxifolia (Blume) Hiern, Trans. Camb. Phil. Soc. 12: 218. 1873. *Leucoxylum buxifolium* Blume, Bijd. 1169. 1827. *Diospyros microphylla* Bedd., Ic. t. 133. 1874; Gamble, Fl. Madras 776(546). 1923.

Trees to 25 m; twigs and petiole hirsute. Leaf blade to 4×2 cm, elliptic, acute at both ends, subpersistently hirsute along margin; veins obscure. Inflorescence of 1-3 male flowers in minute cymes and of solitary female flowers. Calyx 4-lobed, glabrous without, fulvous pilose along margin. Stamens 16. Ovary 4-locular.

Indomalaysia. Fairly common in Kabbinala and Kempuhole forests in lower Ghats. Timber of commercial value. *HFP* 134.

Diospyros candolleana Wight, Ic. t. 1221-2. 1848; Gamble, Fl. Madras 773(543). 1923. *Diospyros canarica* Bedd., Ic. t. 134. 1874.

Trees to 8 m. Leaves 9-15×3.5-5.5 cm, elliptic, acute at both ends, glabrous. Inflorescence a fascicle. Flowers 5-merous, hairy. Sepals rounded in male, acuminate in female. Petals white, reflexed in female. Stamens 10; staminodes usually present in female. Ovary globose, hairy, 4-locular; styles 2.

Western Peninsular India. Fairly common in Ghats in wet deciduous or semi-evergreen forests. April-May. *CJS* 13260, *HFP* 2735.

Diospyros crumenata Thwaites, Enum. 179. 1860; C. B. Clarke in J. Hooker, Fl. Brit. India 3: 567. 1882; Gamble, Man. Indian Timbers 462. 1922.

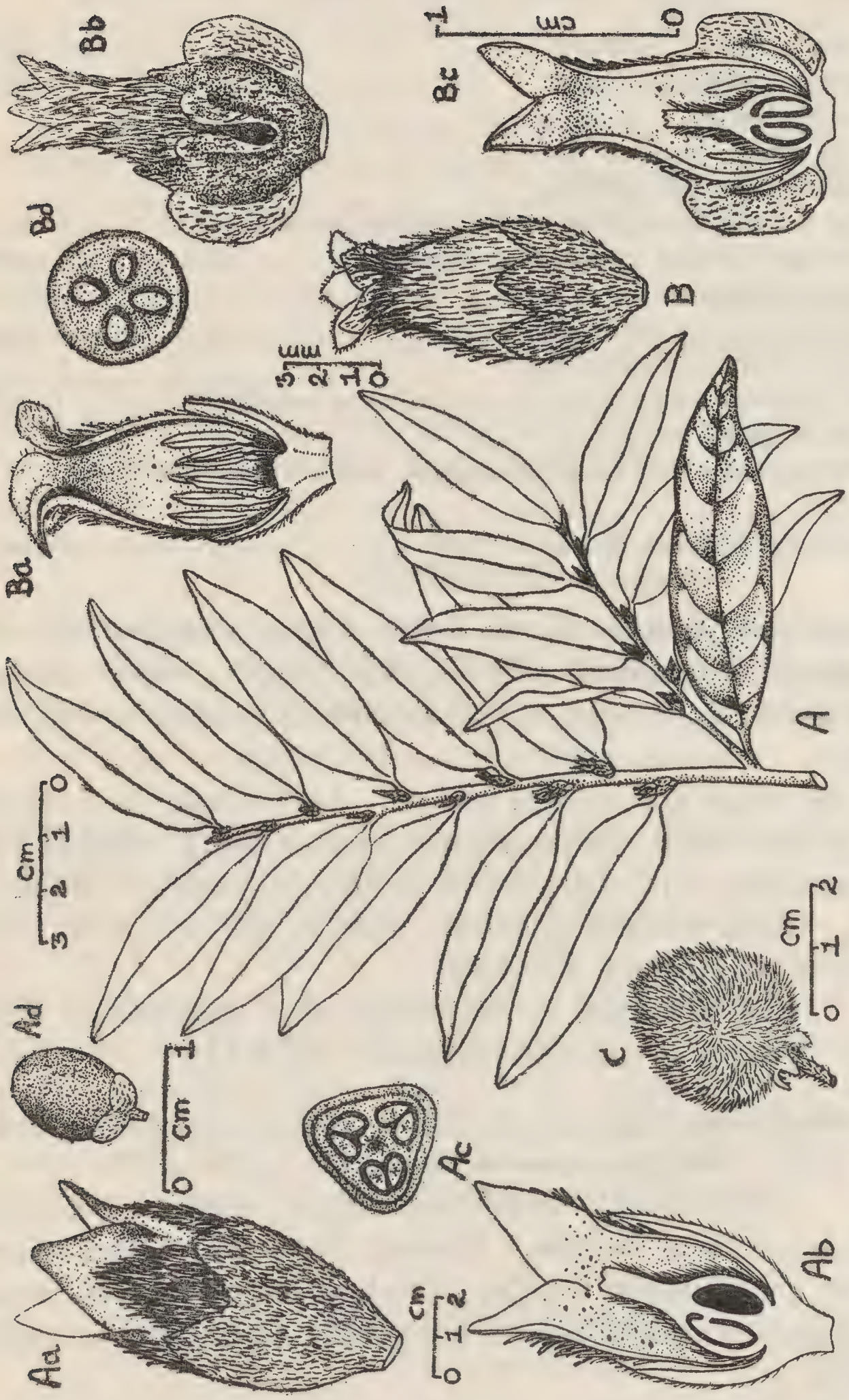


Fig. 41. EBENACEAE. *A. Diospyros nigrescens*: flowering branch; *Aa*, flower; *Ab*, vertical section of flower; *Ac*, transverse section of ovary; *Ad*, fruit. *B. Diospyros melanoxylon*: male flower; *Ba*, same, vertical section; *Bb*, female flower; *Bc*, vertical section of same; *Bd*, transverse section of ovary. *C. Diospyros pruriens*: fruit.

Trees to 15 m. Leaves 6-14×3-7 cm, ovate-elliptic, glabrous, glaucous beneath. Inflorescence of male flowers in cymes, female solitary. Calyx of 5 acute lobes, pubescent; corolla lobes 5, acute, pubescent. Stamens 5, opposite petals. Berry to 3×3 cm, brown-tomentose.

Western Karnataka, Sri Lanka. Fairly common in semi-evergreen forests in lower Bisle Ghat. January-March. *CJS* 13202, 16025.

Diospyros melanoxylon Roxb., Pl. Cor. t. 46. 1795; Gamble, Fl. Madras 772(543). 1923. *Diospyros dubia* Wall. ex A. DC. in DC., Prodr. 8: 223. 1848.

Shrubs or trees to 8 m; twigs softly hairy. Leaves 6-14×5-6 cm, ovate-elliptic, acute, rounded-marginate, sometimes cuneate, pubescent beneath; venation distinct. Male flowers in cymes, female solitary. Calyx lobes of 5 acute lobes in male; in female cordate, broadly 2-winged; corolla lobes 5, densely hairy without. Stamens 10; staminodes often present. Ovary globose, 4-locular. Fruit globose, to 2.2×2 cm, glabrous with age.

Peninsular India, Sri Lanka. Common in dry deciduous forests. March-August. The leaves are used for rolling *bidis* (local cigarettes). *CJS* 13552, 13914.

Diospyros montana Roxb., Pl. Cor. t. 48. 1795; Wight, Ic. t. 1225. 1848; Gamble, Fl. Madras 776(545). 1923.

Shrubs or trees; twigs hairy. Leaves 3-10×2-5 cm, ovate-elliptic, acute, cuneate-cordate, pubescent beneath; veins distinct. Male flowers in cymes, female solitary. Calyx lobes 4, rounded in both male and female; corolla lobes 5, ovate, acute, sparsely pubescent. Stamens 15; staminodes usually present in female. Ovary 2-locular. Berry to 2×2 cm, glabrous.

Indomalaysia to Tropical Australia. Common on the plains. March-August. The wood is of commercial value. *CJS* 14287, *HFP* 20.

Diospyros nigrescens (Dalzell) Saldanha *comb. nov. Maba nigrescens* Dalzell in Dalzell & Gibson, Bombay Fl. 142. 1865; Gamble, Fl. Madras 768(540). 1923.

Shrubs or small trees. Leaves 3-8×1.4-2.8 cm, ovate-lanceolate, acute, subcordate, glaucous beneath. Flowers solitary, in pairs or in short cymes, 3-merous. Calyx lobes hairy; corolla lobes hairy, white. Stamens 6. Ovary globose, hairy. Fruit ellipsoid, hirsute when young.

Western Karnataka in the Ghats. Locally common in lower Shiradi Ghat, on the banks of Kempuhole. February-August. *CJS* 16560, *HFP* 340.

Diospyros pruriens Dalzell, Hooker's J. Bot. Kew Gard. Misc. 4: 110. 1852; Bedd., Ic. t. 129. 1874; Gamble, Fl. Madras 774(544). 1923.

Trees to 12 m. Twigs and petioles hirsute. Leaves 7-15×2.5-6.5 cm, oblong-lanceolate, acute, subcordate, hairy beneath. Male flowers in cymes, female solitary. Calyx hairy in male, of 5 ovate-lanceolate lobes; in female of 4 orbicular lobes. Corolla lobes hairy, in male 5, ovate, acuminate; in female oblong, rounded. Stamens 10. Ovary 2-locular. Berry to 3×3 cm, bristly hairy.

Western Peninsular India. Common in Ghats along river banks, in wet deciduous or semi-evergreen forests. December-May. *CJS* 13709.

Note: According to Kostermans (personal communication) *HFP* 129 and 1535 may represent a new species.

Diospyros sylvatica Roxb., Pl. Cor. t. 47. 1795; Bedd., Ic. t. 121. 1874; Gamble, Fl. Madras 773(543). 1923.

Trees to 25 m. Leaves to 8-16×3-5 cm, oblong-elliptic, acute to rounded, glabrous, drying black. Male flowers in short cymes; female flowers solitary. Calyx lobes 4, rounded, pubescent; corolla lobes 4. Stamens to 24, paired, in threes or in fascicles; staminodes present. Ovary 8-locular; style 4-branched. Endosperm ruminate.

Indomalaysia. Occasional in semi-evergreen forests in Ghats. February-August. The timber is of commercial importance. *CJS* 12839, *HFP* 410.

55. SYMPLOCACEAE

T. P. Ramamoorthy

SYMPLOCOS N. Jacquin

Shrubs or trees. Leaves alternate, often drying yellowish-green, estipulate, simple, crenate-serrate, coriaceous, penninerved. Inflorescence in terminal or axillary, simple or branched racemes or spikes. Flowers bisexual, regular, usually subtended by bracts and 1-3 bracteoles. Calyx lobes 5, imbricate, persistent; petals 5-10, in 1-2 series, usually free, imbricate. Disc 0. Stamens usually many, epipetalous very near base. Ovary inferior, usually 3-locular; ovules generally 2 per locule, axile; style simple; stigma capitate, sometimes lobed. Fruit a 1-3-seeded drupe.

1 Drupe ellipsoid, smooth ..... *S. racemosa*
1 Drupe ampulliform, ribbed ..... *S. cochinchinensis*

Symplocos cochinchinensis (Lour.) Moore, J. Bot. 52: 148. 1914.
Drupatris cochinchinensis Lour., Fl. Cochinch. 314. 1790.

ssp. **laurina** (Retz.) Nooteboom (in press). *Myrtus laurina* Retz., Obs.

Fig. 42. SYMPLOCACEAE. *A. Symplocos racemosa*: flowering branch; *Aa*, flower; *Ab*, fruit. *B. Symplocos cochinchinensis*: flower; *Ba*, vertical section of ovary; *Bc*, fruit.

Bot. 4: 26. 1810. *Symplocos spicata* var. *laurina* (Retz.) C. B. Clarke, in J. Hooker, Fl. Brit. India 3: 573. 1882; Gamble, Fl. Madras 782(549). 1923.

Trees to 15 m. Leaves 6-15×3-8 cm, elliptic-lanceolate. Racemes axillary, sometimes branching. Flowers white. Drupe ampulliform, ribbed, 2-3-seeded.

Western Peninsular India, Sri Lanka. Common in wet-deciduous, semi-evergreen forests in Ghats. September-March. *CJS* 16216, *HFP* 1470.

Note: The Editors are grateful to Dr H. P. Nooteboom (Leiden) for sharing his research with them.

Symplocos racemosa Roxb., [Hort. Beng. 40. 1814, *nom.*] Fl. Ind. 2: 539. 1832; C. B. Clarke in J. Hooker, Fl. Brit. India 3: 576. 1882. *Symplocos beddomei* C. B. Clarke, *l. c.* 582; Gamble, Fl. Madras 783(551). 1923.

Trees to 15 m. Leaves 7-15×3.5-5 cm, elliptic-lanceolate. Flowers white. Drupe ellipsoid, smooth, 1-2-seeded.

Western Peninsular India. Common in Ghats, in semi-evergreen forests. August-March. *CJS* 16232, 16853.

56. MYRSINACEAE

T. P. Ramamoorthy

Unarmed, erect o climbing shrubs, or trees. Leaves usually alternate, estipulate, simple, entire or crenate-serrate, pinnately veined, often gland-dotted or provided with resinous lines. Inflorescence various; bracts usually deciduous. Flowers 4-6-merous, usually bisexual, regular; bracteoles present or absent. Calyx free or fused, persisting; petals usually fused, imbricate or contorted. Stamens opposite petals, epipetalous, sometimes with staminodes; anther dehiscence sometimes poricidal. Ovary superior or half-inferior, 1-locular; ovules usually many, on fleshy, free-central placenta; style simple; stigma capitate, sometimes subsessile. Fruit drupaceous or a berry, 1-many-seeded.

1 Ovary half-inferior, sunk in calyx (best seen in fruit); fruit many-seeded.....**Maesa**
1 Ovary superior; calyx subtending ovary; fruit one-seeded.
2 Petals contorted, united; anthers sagittate at base.....**Ardisia**
2 Petals imbricate, free; anthers not sagittate.....**Embelia**

ARDISIA Swartz *nom. cons.*

Erect shrubs or trees. Leaves sessile or shortly petioled, entire or crenate-serrate, resinous gland-dotted. Inflorescence axillary in panicles

Fig. 43. MYRSINACEAE. *A. Ardisia solanacea*: flowering branch; *Aa*, flower; *Ab*, fruit. *B. Embelia ribes*: bisexual flower; *Ba*, male flower; *Bb*, fruit. *C. Embelia tsjeriam-cottam*: flower; *Ca*, fruit. *D. Maesa indica*: vertical section of flower; *Da*, fruit.

or umbelliform racemes, sometimes corymbose. Petals usually 5; lobes contorted to right, waxy, usually dotted. Stamens subsessile; anthers erect, acute, sagittate at base. Ovary superior, globose; style thick cylindric; stigma indistinct. Drupe to 0.7 cm across, fleshy, 1-seeded, tipped by style.

Ardisia solanacea Roxb., Pl. Cor. t. 27. 1795; Gamble, Fl. Madras 756(531). 1921, excl. syn. *Ardisia humilis* sensu Wight, Ic. t. 1212. 1848.

Shrubs. Leaves 15-22×5-7.5 cm, obovate-oblong, sometimes elliptic-lanceolate, acute-acuminate, cuneate, coriaceous, gland-dotted; veins indistinct. Flowers in racemes, sometimes umbelliform or corymbose. Sepals 5, almost free to base, rounded, glabrous along margin. Corolla waxy-pink, gland-dotted, 5-lobed; lobes ovate-acute, reflexed at anthesis. Drupe globose, becoming black with age.

Peninsular India. Common in moist deciduous forests of upper Ghats and in semi-evergreen forests of lower Ghats. February-September. *HFP* 1576, 2846. (Plate 3).

EMBELIA N. Burman *nom. cons.*

Climbing or erect shrubs or trees. Leaves usually petioled, entire or dentate, often glandular. Inflorescence axillary, in racemes or panicles, sometimes condensed; bracts small. Flowers bisexual or unisexual, pedicelled. Sepals usually free; petals usually papillose on the inside, free, rarely fused. Staminal filaments inserted above the base of petals. Ovary superior, abortive and reduced in male, globose-ovoid in female and bisexual flowers; stigma capitate and subsessile. Drupe subglobose, 1-seeded.

1 Leaves distinctly resinous glandular on either side of midrib below; lianas..... ..... *E. ribes*

1 Leaves eglandular; erect shrubs..... *E. tsjeriam-cottam*

Embelia ribes N. Burman, Fl. Ind. 62, t. 23. 1768; Gamble, Fl. Madras 752(529). 1921. *Embelia glandulifera* Wight, Ic. t. 1207. 1848.

Climbing shrubs; stem with large tubercles at base. Leaves 5-7.5× 2-3 cm, elliptic-lanceolate, acute, rounded at base, gland-dotted with striking glandular pits beneath on either side of midrib. Flowers polygamous. Sepals hairy; petals densely papillose, white. Drupe to 0.5 cm across.

S. Asia to Indomalaysia through Peninsular India. Common along edges of wet deciduous to semi-evergreen forests in upper and lower Ghats. February-June. *CJS* 13776, 16389.

Embelia tsjeriam-cottam DC., Trans. Linn. Soc. London 17: 131. 1834; Wight, Ic. t. 1209. 1848; Gamble, Fl. Madras 753(529). 1921.

Deciduous shrubs or small trees. Leaves 4.5-10×2.5-6 cm, ovate-obovate, acute-acuminate, cuneate, eglandular, glaucous beneath. Racemes linear, sometimes dense. Sepals glabrous, petals papillose on the inside, white.

Tropical India, Burma. Fairly common in dry or moist deciduous forests in western plains and upper Ghats. All seasons. *CJS* 14531, *HFP* 1481.

MAESA Forskal

Erect or subscandent shrubs or small trees. Leaves petioled, usually with transparent resinous streaks. Inflorescence in axillary racemes or panicles, bracteate. Flowers bisexual or unisexual; bracteoles usually 2. Sepals adnate to ovary; petals fused, subcampanulate, usually with resinous lines. Ovary half-inferior, many ovulate. Berry fleshy, many-seeded; calyx persistent around top.

Maesa indica (Roxb.) DC., Trans. Linn. Soc. London 17: 134. 1834. *Baeobotrys indica* Roxb., Fl. Ind. 2: 230. 1824. *Baeobotrys dubia* Wall. in Roxb., Fl. Ind. 2 : 235. 1824. *Maesa dubia* (Wall.) DC., Trans. Linn. Soc. London 17: 134. 1834; Gamble, Fl. Madras 749(527). 1921. *Maesa perrottetiana* A. DC. in DC., Prodr. 8: 80. 1844; Gamble, Fl. Madras 749(527). 1921. *Maesa indica* var. *perrottetiana* (A. DC.) C. B. Clarke in J. Hooker, Fl. Brit. India 3: 509. 1882.

Shrubs; branches and leaves pilose to completely glabrous. Leaves 10-20×5-10 cm, crenate-serrate, ovate-lanceolate, acuminate, rounded at base, with resinous streaks. Flowers bisexual. Sepals 5, ciliate or not along margin; petals 5, white. Fruit to 0.5 cm across.

India. Common, in and around edges of wet-deciduous or semi-evergreen forests, in upper and lower Ghats. October-June. *CJS* 16413, *HFP* 366.

Note: Gamble, following Mez (in Engl., *Pflanzenr.* 9: 15-54. 1903) recognized 3 species: *M. velutina* Mez with "branches and leaves densely ferruginous tomentose when young, later on pilose;" *M. dubia* Wall. with "branches and leaves sparsely pilose;" *M. perrottetiana* A. DC. with "whole plant glabrous". Study of our collections reveals a spectrum from ferruginous-tomentose when young to glabrous when old, with intermediates. Another character, used by Gamble: calyx lobes ciliate on margin or not, is coordinated with the degree of pilosity and age. The character of petiole length of 0.5″ to 0.75″ and 1″ varies independently of the ciliation.

Fig. 44. PRIMULACEAE. *A. Anagallis arvensis*: habit; *Aa*, flower; *Ab*, vertical section of the same; *Ac*, transverse section of ovary; *Ad*, dehisced fruit. *B. Anagallis pumila*: habit; *Ba*, flower.

57. PRIMULACEAE

T. P. Ramamoorthy

ANAGALLIS Linnaeus

Erect or creeping, glabrous herbs. Leaves opposite to alternate above, estipulate, sessile, entire, usually palmately veined. Inflorescence of axillary fascicles. Flowers bisexual, regular, usually bracteate; pedicel long and curving in fruit. Calyx of 5 imbricate persisting lobes; corolla deeply 5-partite, imbricate, sometimes campanulate. Stamens 5, opposite the petals, epipetalous. Ovary superior, 1-locular; ovules many on free central placenta; style simple, persistent; stigma capitate. Capsule circumscissile, with many smooth seeds.

1 Leaf 3-nerved; petals blue, glandular-hairy along margin, longer than calyx..... ..... *A. arvensis*
1 Leaf 1-nerved; petals white, eglandular, shorter than calyx..... *A. pumila*

Anagallis arvensis L., Sp. Pl. 211. 1753; Gamble, Fl. Madras 747 (525). 1921. *Anagallis latifolia* L., Sp. Pl. 149. 1753; Wight, Ic. t. 1205. 1848.

Creeping herbs. Leaves opposite, 1-1.5×0.5-1 cm, ovate, acute, cordate-amplexicaul, membranous, palmately 3-veined. Pedicel 1-1.25 cm long, curving in fruit. Sepals ovate-lanceolate, acute, somewhat keeled; petals orbicular, narrowed below, glandular-hairy along margin, blue.

Temperate and Tropical regions. Common weed in plains and upper Ghats, usually along tank margins and moist bunds of fields, or in the open where enough moisture is available. All seasons. *CJS* 15726, *HFP* 2046.

Anagallis pumila Swartz, Prod. Veg. Ind. Occ. 1: 40. 1788; Gamble, Fl. Madras 747(525). 1921. *Centunculus tenellus* Duby in DC., Prodr. 8: 71. 1844; Wight, Ic. t. 2000. 1853. *Micropyxis tenella* (Duby) Wight, Ic. t. 1585. 1850.

Erect herbs to 12 cm. Leaves alternate, opposite below, to 5×2 cm, ovate, acute, cordate, 1-nerved. Sepals ovate-lanceolate; petals white.

Pantropical. Fairly common in seasonally wet, open areas, in plains and upper Ghats. October. *CJS* 11132, 15223.

58. PITTOSPORACEAE

T. P. Ramamoorthy

PITTOSPORUM Banks ex Solander

Leaves alternate, estipulate, mostly entire, coriaceous, penninerved.

Fig. 45. PITTOSPORACEAE. *A. Pittosporum floribundum*: flowering twig; *Aa*, flower; *Ab*, same, vertical section; *Ac*, ovary in section. *B. Pittosporum dasycaulon*: fruiting twig.

Flowers bracteate, bisexual, regular, pedicelled, 5-merous. Sepals free; petals usually free. Anthers usually sagittate below, dorsifixed. Ovary superior, ellipsoid, glabrous or pubescent, 1-locular, with 2-5 intrusive parietal or basal placentas; style persisting in fruit. Fruit a 2-5-valved, thick-coriaceous, loculicidal capsule. Seeds many, covered with resinous pulp.

1 Branches and axis of inflorescence tomentose.....*P. dasycaulon*
1 Branches and axis of inflorescence at best glabrescent.....*P. floribundum*

Pittosporum dasycaulon Miq., Anal. Bot. 3: 5. 1852; Gamble, Fl. Madras 55(40). 1915; Gowda, J. Arnold Arbor. 32: 324. 1951.

Trees, with shoots tomentose. Leaves elliptic, acuminate, cuneate, 8-15×2-3.5 cm, glabrous with age. Inflorescence umbels of short racemes. Sepals ovate, acute; petals 1 cm long, linear-oblong, rounded, yellowish. Ovary sessile, elliptic, tomentose. Capsule 2-valved, 1×0.8 cm, pubescent, drying blue-black, usually enclosing 4 seeds.

South W. India. Common in wet deciduous to semi-evergreen forests in Ghats. February-June. *CJS* 16533, 16675.

Pittosporum floribundum Wight & Arn., Prod. 154. 1834; Gamble, Fl. Madras 55(40). 1915; Gowda, J. Arnold Arbor. 32: 332. 1951; Sant., Fl. Khandala ed. 3, 11. 1967. *Pittosporum napaulense* sensu Blatter, J. Bombay Nat. Hist. Soc. 34: 302. 1930, non (DC.) Rehd. & Wilson.

Trees to 12 m. Leaves crenulate, obovate, short acuminate, cuneate. Panicle short, terminal. Sepals oblong; petals 0.7 cm long, linear-oblong, white. Ovary elliptic, glabrous. Capsule 0.7×0.7 cm, 2-valved, 4-seeded.

South W. India. Common in semi-evergreen to wet deciduous forests, usually along roadsides, in Ghats. May-September. *CJS* 14332, *HFP* 299.

Note: According to Gowda, *Senacia napaulensis* DC. (Jan. 1824) and *Celastrus verticillatus* Roxb. (Mar.-June, 1824), do not belong to the synonymy of this species but to a Himalayan species, *Pittosporum napaulense* (DC.) Rehd. & Wilson (1916).

59. CRASSULACEAE

K. N. Gandhi

KALANCHOE Adanson

Fleshy undershrubs or herbs. Leaves opposite, simple to compound, crenate-serrate; venation pinnate, obscure. Inflorescence mostly a terminal panicled cyme; bracts linear-lanceolate. Flowers regular, 4-merous,

Fig. 46. CRASSULACEAE. *A. Kalanchoe bhidei*: *Aa*, vertical section of flower; *Ab*, gynoecium; *Ac*, transverse section of carpels. *B. Kalanchoe floribunda*: flower. *C. Kalanchoe laciniata*: flower.

bisexual. Sepals connate, persistent. Corolla gamopetalous, urceolate; lobes shorter than tube, spreading. Stamens 8, biseriate, epipetalous. Pistils 4, almost free, each subtended by a lanceolate scale; ovary glabrous, with 2-seriate ovules, attenuated into a subulate style; stigma obliquely truncate. Follicles enclosed in the withering corolla, many-seeded.

1 Flowers pendulous; sepals connate for more than 3/5 of their length.....*K. pinnata*
1 Flowers erecto-patent; sepals almost free to the base.
2 Leaves pinnatifid.....*K. laciniata*
2 Leaves not pinnatifid.
3 Inflorescence usually glandular-hairy, spreading, more than 20 cm long. Corolla yellow.....*K. floribunda*
3 Inflorescence glabrous, to 15 cm long. Corolla white.....*K. bhidei*

Kalanchoe bhidei Cooke, Fl. Bombay 467. 1907; Gamble, Fl. Madras 450(319). 1919.

Pale brown herbs. Leaves elliptic-oblong, obtuse, cuneate, to 9×4 cm. Panicle spreading. Flowers erect; pedicels to 1 cm long. Sepals free or connate at base, lanceolate, acuminate, 0.6 cm long. Corolla white, 1-2 cm long.

South India. Frequent in scrub. December-February. *CJS* 11999, 16047.

Kalanchoe floribunda Wight & Arn., Prodr. 359. 1834; Gamble, Fl. Madras 450(319). 1919.

Deciduous herbs; upper parts usually glandular-hairy. Leaves elliptic-obovate, to 10 cm long. Panicle large; upper branches racemose. Flowers erect; pedicels 1-2 cm long. Sepals almost free, 0.5 cm long. Corolla yellow, 1.5 cm long.

Hills of South India. Collected once in flower and fruit from Belvathally (scrub) on March 10, 1969. *CJS* 12868.

Kalanchoe laciniata (L.) Persoon, Syn. 446. 1805; Wight, Ic. t. 1158. 1846; Gamble, Fl. Madras 451(319). 1919. *Cotyledon laciniata* L., Sp. Pl. 430. 1753.

Glandular-hairy herbs. Leaves deeply pinnatifid (often appearing compound); segments linear-lanceolate, sparsely hairy, to 9×1.5 cm. Panicle shortly branched, compact. Flowers erect; pedicels 0.5 cm long. Sepals distinct almost to base, lanceolate, acute, 0.8 cm long. Corolla yellow, 1.5-2 cm long.

Indomalaysia. Occasional along Arsikere-Hassan Road (Plain). December-February. *CJS* 11988, 16077.

Kalanchoe pinnata (Lam.) Persoon, Syn. 446. 1805; Backer & Bakh. f., Fl. Java 1: 201. 1963. *Cotyledon pinnata* Lam., Encycl. 2: 141. 1786. *Bryophyllum pinnatum* (Lam.) Oken, Allg. Naturgesch. 3: 1966. 1841; Gamble, Fl. Madras 451(319). 1919; Adams, Fl. Pl. Jamaica 310. 1972.

Leaves simple or pinnately 3-5-foliolate, elliptic-oblong, obtuse at both ends, to 15×7 cm. Panicle lax. Flowers pendulous; pedicels 1-1.5 cm long. Calyx tubular, inflated, shortly lobed, 3-4 cm long. Corolla constricted below the middle, green, 4-5 cm long. Stamens inserted below the middle of corolla.

Tropics. Occasional herbs in plain and upper Ghats; often cultivated in gardens. December-February. *CJS* 12319, 15739.

Note: The leaves are remarkable for producing new plants vegetatively at their crenatures.

60. SAXIFRAGACEAE

K. N. Gandhi

PARNASSIA Linnaeus

Glabrous, small, rhizomatous, scapigerous herbs. Stipules 0. Leaves radical, simple, entire, cordate; petiole slender; venation inconspicuous.

Fig. 47. SAXIFRAGACEAE. *A. Parnassia mysorensis*: habit; *Aa*, flower, viewed from above; *Ab*, same, lateral view; *Ac*, transverse section of ovary; *Ad*, dehisced fruit.

Scape 1-flowered, with a foliaceous, small bract at middle. Flowers 5-merous, bisexual, regular. Calyx deeply partite; lobes imbricate, ovate-oblong, subobtuse at apex. Petals shortly clawed. Stamens alternating with staminodes; filaments subulate. Ovary 1-locular; ovules many, parietal; style short, slightly accrescent; stigma 3-4-lobed, persistent. Fruit a capsule, subtended by persistent calyx, loculicidally 3-4-valved.

Parnassia mysorensis Heyne ex Wight & Arn., Prodr. 35. 1834; Gamble, Fl. Madras 448(317). 1919.

Leaves ovate-orbicular, subacute, 1-2 cm long. The 6-10 scapes 8-12 cm long. Calyx 3 mm long. Petals white, subcrenulate, 0.7 cm long. Staminodes clavate, obscurely 3-lobed. Ovary almost superior. Capsule globose, 0.4 cm across; seeds subcylindrical, reticulate.

India. Locally common at peak of Vanagur (upper Bisle Ghat) at about 1000 m on superficial soil of wet rocks. July-September. *HFP* 748, 1995.

61. ROSACEAE

K. N. Gandhi

Leaves usually alternate; stipules usually present; venation generally pinnate. Flowers usually bisexual. Calyx gamosepalous, often with hypanthium, free or adnate to ovary; lobes usually 5, distinct. Petals usually 5, inserted on the rim of hypanthium, free, usually imbricate, sometimes clawed. Disc lining hypanthium or forming a ring at its base. Stamens generally numerous and free, in 1-few rows, on the throat of hypanthium or on the disc; filaments generally incurved in bud. Gynoecium of 1-many carpels, free or united.

1 Plants unarmed. Pistil solitary.....**Prunus**
1 Plants minutely or distinctly prickled. Pistils many.
2 Stipules adnate to the base of petiole; receptacle urceolate.....**Rosa**
2 Stipules almost free; receptacle conical.....**Rubus**

PRUNUS Linnaeus

Leaves simple, often with 2-few glands beneath towards the base or on the petiole; stipules free, caducous. Hypanthiumcampanulate or funnel-shaped, deciduous. Sepals small. Petals villous, sometimes sepaloid. Stamens 10-numerous, inserted on the throat of hypanthium; anthers dorsifixed. Pistil 1; ovary superior, free from hypanthium tube, sessile, 1-locular, with 2 pendulous ovules; style terminal; stigma peltate. Fruit a drupe, 1-2-seeded.

Fig. 48. ROSACEAE. *A. Rubus fockei*: habit; *Aa*, flower; *Ab*, fruit; *Ac*, pyrene. *B. Prunus ceylanica*: flower; *Ba*, transverse section of ovary; *Bb*, fruit. *C. Rubus ellipticus*: flower.

Prunus ceylanica (Wight) Miq., Fl. Ind. Bat. 1, 1: 366. 1855; Kalkman, Blumea 13: 52. 1965. *Pygeum zeylanicum* Gaertner, Fruct. 218, t. 46. 1788; Bedd., Fl. Sylv. t. 59. 1870 ('*ceylanicum*'). *Pygeum acuminatum* Colebr., Trans. Linn. Soc. London 12: 360. t. 18. 1818, non *Prunus acuminata* Michx. 1803; Gamble, Fl. Madras 439(311). 1919. *Polydontia ceylanica* Wight, Ill. 1: 203. 1840 ('*Polyodontia*'). *Pygeum wightianum* Bl. ex C. Muell. in Walp., Ann. 4: 642. 1857; Gamble, Fl. Madras 439(311). 1919. *Pygeum gardneri* J. Hooker, Fl. Brit. India 2: 321. 1878; Gamble, Fl. Madras 439(311). 1919. *Pygeum sisparense* Gamble, Bull. Misc. Inform. 238. 1918; Fl. Madras 439(311). 1919.

Lofty trees. Petiole 0.7-1.5 cm long; leaf blade entire, elliptic-ovate or oblong-lanceolate, acuminate, rounded-cuneate, subcoriaceous, glabrous, to 14×6 cm; nerves raised beneath. Raceme simple; peduncle pubescent, 2.5-6 cm long. Flowers many, pedicelled, white. Hypanthium hairy within. Stamens 10-40. Ovary glabrous. Drupe 0.8×1.8 cm, 2-seeded.

South India to S. E. Asia. Evergreen trees in Ghats. September-February. *CJS* 16456, *HFP* 870.

Note: We assume Dr. Kalkman has used Wight's (1843) basionym rather than Gaertner's (1788) earlier orthographic variant for good reason.

ROSA Linnaeus

Prickly shrubs. Leaves odd-pinnate; stipules adnate to peotile; leaflets 3-many, opposite, serrate. Inflorescence a terminal corymb or flowers solitary; bracts lanceolate, caudate. Hypanthium urceolate. Sepals foliaceous. Petals 5 or apparently more, imbricate, large. Stamens 30 or more, inserted on the annular disc; filaments filiform; anthers dorsifixed. Gynoecium of many pistils; ovary free from hypanthium, with solitary, pendulous ovule; styles free or connate, terminal. Fruit a cluster of achenes, included in hypanthium.

Rosa multiflora Thunb., Fl. Jap. 240. 1784; Backer & Bakh. f., Fl. Java 1: 520. 1963.

Scandent shrubs. Bracts and stipules pectinate, leaflets usually 7, pubescent beneath. Inflorescence corymbose; peduncle eglandular, bristly; bracts 1-2 cm long, pubescent beneath, caducous; pedicels 3-5 cm long. Sepals ovate-lanceolate, caudate, pubescent, 1-1.4 cm long. Petals many, glabrous, pink, large. Styles connate; stigma capitate.

E. Asia. Occasional in hedges and abandoned coffee plantations in upper Ghats. All seasons. *CJS* 9940, 16218.

RUBUS Linnaeus

Leaves simple or compound; stipules free or adnate to petiole at its base. Hypanthium widely campanulate, flat or various. Sepals persistent. Stamens many, inserted on the rim of hypanthium; anthers dorsifixed. Gynoecium of few-many, free pistils, arranged on a convex or columnar receptacle, free from hypanthium; ovary superior, 1-locular, with 2 pendulous ovules; style subterminal, filiform; stigma minute. Fruit an aggregate of fleshy drupelets on a dry receptacle.

1 Stem with spreading bristles; stipules entire; leaves not fulvous tomentose beneath.... ..... *R. ellipticus*
1 Stem with appressed tomentum; stipules laciniate; leaves fulvous tomentose beneath ..... *R. fockei*

Rubus ellipticus J. E. Sm. in Rees, Cyclop. 30: n. 16. 1815; Gamble, Fl. Madras 441(313). 1919. *Rubus gowreephul* Roxb., Fl. Ind. 2: 517. 1832; Wight, Ic. t. 230. 1839. *Rubus wallichianus* Wight & Arn., Prodr. 298. 1834; Wight, Ic. t. 231. 1839.

Straggling shrubs with stiff red bristles; prickles short. Leaves pinnately trifoliolate but simple or 3-lobed on juvenile shoots; stipules entire, linear; leaflets serrate, obovate, pubescent beneath, rigid. Inflorescence a corymbose panicle; bracts linear. Flowers bisexual. Calyx bristly toward base. Sepals lanceolate, acuminate, tomentose, 0.7 cm long. Petals white, as long as or longer than calyx. Ovary sparsely pubescent. Drupelets exposed, globose, orange.

Sri Lanka to Burma. Collected once in flower from Yethinahalla (upper Shiradi Ghat) on December 10, 1969. *CJS* 15806.

Rubus fockei Gandhi, *nom. nov. Rubus fulvus* Focke, Biblioth. Bot. 72: 81. 1910, non Sudre, 1902; Gamble, Fl. Madras 441(313). 1919.

Straggling or climbing, velvety shrubs; prickles short. Leaves simple; bracts and stipules laciniate; blade angled and serrulate along the margin, ovate, acute, cordate, rugose and hairy on nerves above, 6-13×6-12 cm; venation palmate. Panicle fulvous-tomentose except corolla. Flowers bisexual. Sepals ovate, 1 cm long. Petals white, as long as calyx. Drupelets red.

Western Ghats. Scattered on edges of forests in upper Ghats. February-October. *CJS* 12807, *HFP* 578.

* * *

Eriobotrya japonica (Thunb.) Lindl., medium unarmed trees with simple, serrate leaves and an inferior ovary are occasionally cultivated for their fruits.

62. FABACEAE

K. N. Gandhi

Trees, shrubs and herbs, often climbers. Stipules present. Leaves alternate, usually pinnately compound; leaflets usually opposite. Inflorescence usually racemose, axillary and terminal. Flowers usually bisexual. Calyx 4-5-toothed or -lobed, often 2-lipped, usually persistent. Petals usually 5 and clawed. Stamens usually 10, often united. Ovary superior, 1-locular; ovules on ventral suture; style and stigma simple. Fruit usually a dry pod, splitting longitudinally (legume), sometimes transversally into 1-seeded joints (loment) or indehiscent.

1 Flowers dense, radially symmetrical; petals valvate; leaves bipinnate...2 **Mimosoideae**
1 Flowers lax, bilaterally symmetrical; petals imbricate or none.
2 Upper petal innermost (or petals 0); leaves usually bipinnate or even-pinnate .....1 **Caesalpinioideae**
2 Upper petal outermost; leaves usually odd-pinnate.....3 **Faboideae**

Subfamily 1. CAESALPINIOIDEAE

Leaves usually bipinnate or pinnate; leaflets usually estipellate. Flowers bisexual, 5-merous. Sepals usually imbricate, often almost free, the lower (outermost) sometimes larger. Petals free or 0, subsimilar or upper (innermost) petal larger, all imbricate. Stamens 10, sometimes replaced in part by staminodes, equal, usually free. Style slightly curved.

Note: Most modern authors place the Caesalpinioids first because they are most similar to the Rosalean stock from which the family presumably evolved.

1 Leaves bipinnate; branchlets and leaf rachises armed.
2 Flowers and fruits subsessile (pedicel less than 0.5 cm).....**Wagatea**
2 Flowers and fruits distinctly pedicelled (over 1 cm).
3 Pedicel jointed at middle; pod winged on upper suture.....**Mezoneuron**
3 Pedicel not jointed; pods not winged on upper suture.
4 Pod winged at apex; ovule 1.....**Pterolobium**
4 Pod not winged; ovules few.....**Caesalpinia**
1 Leaves once pinnate, 1-foliolate or simple; branchlets and rachises unarmed.
5 Leaves simple, 2-lobed.....**Bauhinia**
5 Leaves pinnate.
6 Petals 0.
7 Leaflets alternate; stamens 10; ovules 2.....**Kingiodendron**
7 Leaflets opposite; stamen 7; ovules many.....**Saraca**
6 Petals present.
8 Petals 3.
9 Leaflets in many pairs; stamens 3; ovules many.....**Tamarindus**
9 Leaflets in 2 pairs; stamens 5; ovules 2.....**Humboldtia**
8 Petals 5.

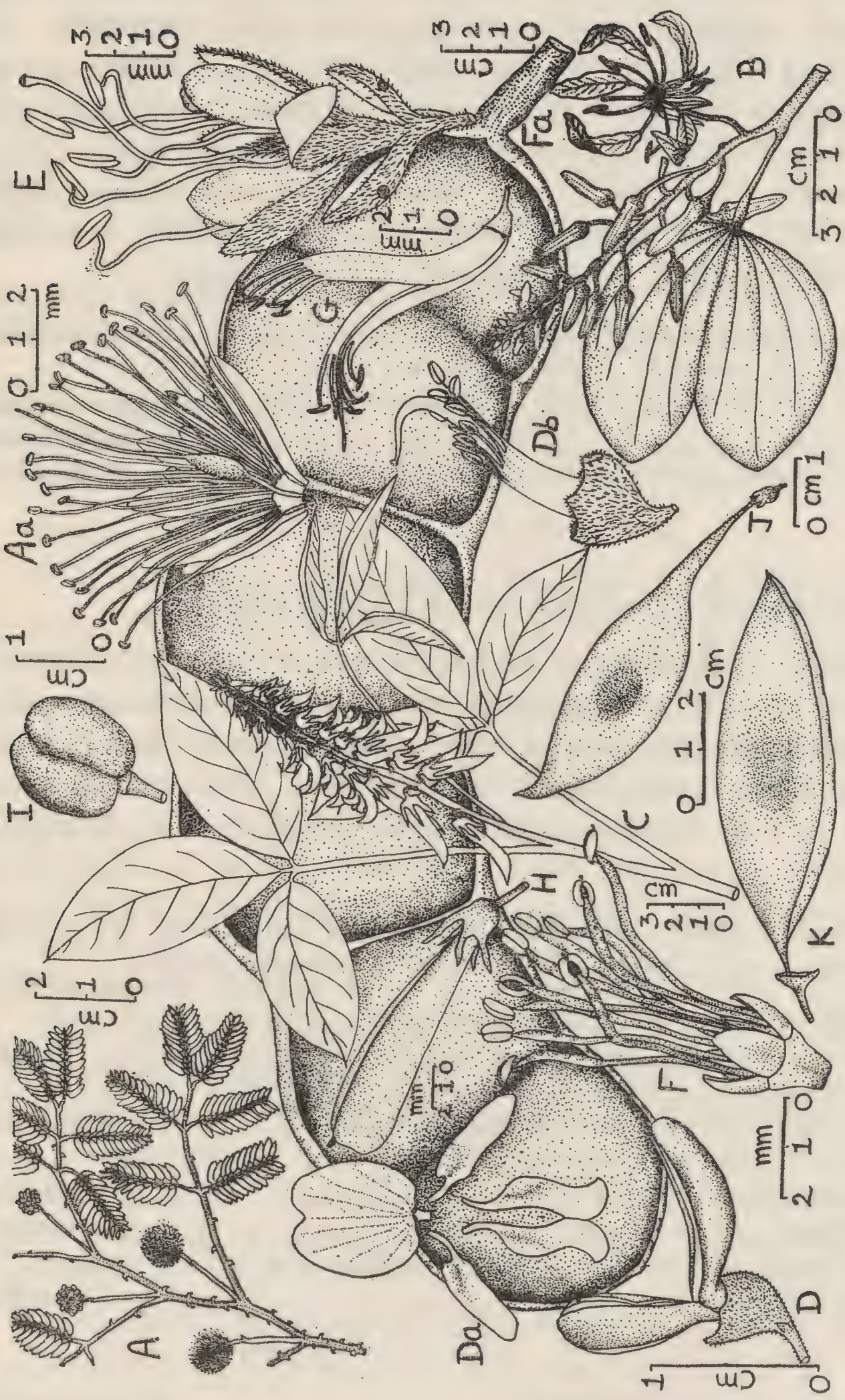


Fig. 49. FABACEAE. *Acacia sinuata*: flowering twig; *Aa*, dissected flower. *B. Bauhinia phoenicea*: flowering twig. *C. Crotalaria pallida*: flowering twig. *D. Derris canarensis*: flower; *Da*, petals; *Db*, stamens and pistil. *E. Humboldtia brunonis*: flower; *F*, flower. *F. Entada pursaetha*: flower; *Fa*, fruit. *G. Smithia conferta*: stamens and pistil. *H. Crotalaria heyneana*: fruit. *I. Cynometra bourdillonii*: fruit. *J. Dalbergia sissoides*: fruit. *K. Mezoneuron cucullatum*: fruit.

10 Leaflets more than 3 pairs; some stamens staminodial; anther poricidal; ovules many ..... **Cassia**
10 Leaflets 3 pairs; stamens 10; anthers longitudinally dehiscent; ovules 2..... ..... **Cynometra**

BAUHINIA Linnaeus

Note: Some authors regard the subgenera of *Bauhinia* as genera (De Wit, *Reinwardtia* 3: 381. 1956). We are maintaining the genus in its broad sense.

Woody, sometimes climbing with tendrils. Leaves simple, deeply emarginate, subcordate; venation palmate. Flowers rarely unisexual. Petals subequal, spreading. Pistil curved; ovary long-stipitate, many-ovuled. Pod usually compressed and oblong.

1 Climber. Calyx segments longer than hypanthium; petals scarlet; stamens 5.... .....*B. phoenicea*
1 Tree. Calyx spathaceous, shortly toothed; petals yellowish; stamens 10....*B. racemosa*

Bauhinia phoenicea Heyne ex Wight & Arn., Prod. 296. 1834; Gamble, Fl. Madras 408(289). 1919. *Phanera phoenicea* (Wight & Arn.) Bentham in Miq., Pl. Jungh. 262. 1852. *Bauhinia benthamii* Bedd., Ic. t. 107. 1874 ('*Benthami*').

Climbers without tendrils; enations scarlet. Leaf 12×10 cm, 1/4 cleft. Hypanthium 2 cm long; segments 2.5 cm long. Petals scarlet. Stamens 5; staminodes 0. Pod scarlet, pubescent.

Western Ghats. Frequent in lower Ghats. September-March. *CJS* 12135, *HFP* 2468.

Bauhinia racemosa Lam., Encycl. 1: 390. 1785; Bedd., Fl. Sylv. t. 182. 1872; Gamble, Fl. Madras 406(288). 1919. *Piliostigma racemosa* (Lam.) Bentham in Miq., Pl. Jungh. 262. 1852.

Deciduous, bushy trees to 6 m. Leaf 3 × 4 cm, 1/3 cleft. Hypanthium short; limb spathaceous, toothed at apex. Petals white or fading yellow. Stamens (or staminodes) 10. Pod glabrous.

Indomalaysia, China. Frequent trees in dry deciduous forests. February-August. This taxon may be dioecious. *CJS* 13220, *HFP* 1506.

Note: *Bauhinia purpurea* L. and *B. variegata* L. are frequently cultivated as roadside or garden trees.

CAESALPINIA Linnaeus

Armed climbing shrubs or trees. Leaves bipinnate. Outer sepals slightly larger. Petals usually yellow. Stamens declinate; filaments villous at base. Ovary sessile, few-ovuled; style usually persistent. Pod oblong or obovoid, not winged, subturgid, beaked by style.

1 Pedicels prickly; leaflets less than 0.3 cm broad; pod bristly.....*C. mimosoides*
1 Pedicels hirsute or tomentose, not prickly; leaflets more than 0.3 cm broad.
2 Stipules foliaceous, pinnate, persistent. Pod prickly.....*C. crista*
2 Stipules simple, deciduous. Pod smooth.....*C. decapetala*

Caesalpinia crista L., Sp. Pl. 380. 1753; Gamble, Fl. Madras 393(278). 1919.

Stipules 3×2.5 cm; rachis to 50 cm long; pinnae 5-8 pairs, 10 cm long; leaflets subacute at both ends, mucronate, 3×1.5 cm. Raceme often panicled. Pod obovoid, with wiry prickles, 1-2-seeded.

Tropics. Occasional in plains. August-February. *CJS* 10810, 15366.

Caesalpinia decapetala (Roth) Alston in Trimen, Handb. Fl. Ceylon 6: 89. 1931; Sant. & Wagh, Bull. Bot. Surv. India 5: 108. 1963. *Reichardia decapetala* Roth, Nov. Pl. Sp. 212. 1821. *Caesalpinia sepiaria* Roxb., [Hort. Beng. 32. 1814, *nom.*] Fl. Ind. 2: 360. 1832; Wight, Ic. t. 37. 1838; Gamble, Fl. Madras 394(279). 1919.

Stipules ovate, acute, deciduous. Leaf rachis 16 cm long; pinnae 8-10 pairs, 6 cm long, obtuse at both ends, 1.2×0.5 cm. Raceme simple. Pod falcate-oblong, smooth, brown, veined, 6-8-seeded.

Indomalaysia, China. Frequent in plains and upper Ghats. All seasons. *HFP* 1338, 2429.

Caesalpinia mimosoides Lam., Encycl. 1: 452. 1785; Wight, Ic. t. 392. 1840; Gamble, Fl. Madras 394(279). 1919.

Stipules caducous; leaf rachis 35 cm long; pinnae 18-22 pairs, 4 cm long; leaflets oblong, obtuse at both ends, 0.7×0.25 cm. Raceme simple. Pod bristly, obliquely oblong, 1-3-seeded.

South W. India, Sri Lanka, Burma. Common across the Ghats. November-March. *CJS* 11494, 12253.

* * *

Caesalpinia pulcherrima (L.) Swartz, is a shrub commonly cultivated for showy red or yellow flowers.

CASSIA Linnaeus

Leaves even pinnate, often with glands on petiole or rachis. Leaflets in 3 or more pairs. Hypanthium short. Petals usually yellow. Antheriferous stamens 6-7 (2-3 larger), the rest staminodial or absent; anthers poricidal. Ovules many. Pod various, transversely septate between the seeds, many-seeded.

1 Leaflets more than 20 pairs, sessile, less than 0.5 cm wide. Sepals narrow, acute .....*C. mimosoides*

1 Leaflets less than 16 pairs, petiolulate, more than 0.8 cm wide. Sepals more than 0.5 cm broad, obtuse.
2 Leaves without glands on rachis or petiole.
3 Leaflets over 3 cm broad. 10 stamens fertile. Pod terete, 30-60 cm long, indehiscent.....*C. fistula*
3 Leaflets less than 2.5 cm broad. 6-7 stamens fertile. Pod flat, less than 20 cm long, dehiscent.
4 Trees. Leaflets retuse, tipped with minute bristle. Pod with thick sutures, indented between seeds.....*C. siamea*
4 Shrubs. Leaflets obtuse, conspicuously tipped with a bristle. Pod with thin sutures, uniformly flat.....*C. montana*
2 Leaves with 1-few glands on petiole or rachis.
5 Petiole with a single gland at base; rachis eglandular.
6 All parts softly pubescent.....*C. hirsuta*
6 All parts glabrous.....*C. occidentalis*
5 Petiole eglandular; rachis with glands between the leaflets.
7 Stipules large, cordate, persistent. Leaflets more than 8 pairs.....*C. auriculata*
7 Stipules linear, deciduous. Leaflets less than 6 pairs.
8 Glands clavate. 10 stamens antheriferous. Pod flat.....*C. surattensis*
8 Glands subulate. 6-7 stamens antheriferous. Pod turgid.
9 Leaflets ovate, acuminate. Pod sub-cylindric.....*C. floribunda*
9 Leaflets obovate, obtuse. Pod sub-tetragonous.....*C. tora*

Cassia auriculata L., Sp. Pl. 379. 1753; Gamble, Fl. Madras 402 (284). 1919.

Shrubs. Stipules large, foliaceous, reflexed, reniform. Leaves 8 cm long; leaflets 8-12 pairs, elliptic-oblong, obtuse and minutely apiculate, 2×1 cm, with subulate glands in between. Corymb axillary and terminal, often panicled; bracts ovate, acuminate. Stamens 6-7 antheriferous, 2 larger. Pod flat, dehiscent, 10×1.5 cm, obtuse at apex with age.

Indomalaysia. Common on dry, stony soil across the plains. All seasons. *CJS* 11945, *HFP* 1512.

Cassia fistula L., Sp. Pl. 377. 1753; Gamble, Fl. Madras 400(283). 1919. *Cassia rhombifolia* Roxb., Fl. Ind. 3: 334. 1832; Wight, Ic. t. 269. 1840.

Deciduous trees. Leaves 40 cm long, eglandular; stipules linear, deciduous; leaflets 4-8 pairs, ovate, to 10×4.5 cm. Raceme 35 cm long; bracts deciduous. Stamens 2-3 larger, the rest subequal. Fruit indehiscent, cylindrical, to 60×2 cm.

China, Indomalaysia. Frequent in plains and upper Ghats. A showy tree when in flower. January-September. *CJS* 12345, *HFP* 2763.

Cassia floribunda Cav., Descr. 132. 1802; Backer & Bakh. f., Fl. Java 1: 539. 1963. *Cassia corymbosa* Ortega, Hort. Matr. Dec. 10: 124. 1800, non Lam., 1785. *Cassia laevigata* Willd., Enum. Hort. Berol. 441. 1809; Gamble, Fl. Madras 402(284). 1919.

Shrubby herbs. Leaves 12-15 cm long, with glands only between

leaflets; leaflets 3-4 pairs, elliptic-ovate, 10×4 cm. Corymb axillary; bracts lanceolate; 2 stamens larger. Pod subcylindric, dehiscent, 8×0.8 cm.

Tropical America. Introduced and run wild. Collected only twice (Harihalli, Belur). August-January. *CJS* 9054, 9055.

Cassia hirsuta L., Sp. Pl. 378. 1753; Gamble, Fl. Madras 401(284). 1919.

Softly pubescent, shrubby herbs. Leaves 15-20 cm long, with a gland at the base of the petiole; leaflets elliptic-ovate, acuminate, truncate, to 10×4.5 cm. Corymbs in panicle, terminal; bracts lanceolate, acuminate. Stamens 6-7 antheriferous, 2 larger. Pod turgid, dehiscent, 12×0.5 cm.

Tropical America. Introduced and running wild. Frequent across plains and in upper Ghats. July-January. *CJS* 12189, *HFP* 2056.

Cassia mimosoides L., Sp. Pl. 379. 1753; Gamble, Fl. Madras 403 (285). 1919.

Prostrate herbs. Leaves 6-10 cm long, with a gland at the tip of petiole; leaflets 0.3-0.5×0.1-0.2 cm, puberulous, withe ccentric midrib. Flowers solitary, small. Stamens 10 antheriferous, alternately long and short. Pod flat, dehiscent, to 3.5×0.3 cm.

Tropics. Frequent in moist places of plains and upper Ghats. May-October. *CJS* 14671, 14708.

Note: Two collections (*CJS* 10037 & 10039) have distinctly larger leaflets (to 1×0.2 cm) in 40 pairs. These may be involved with *C. mimosoides* var. *wallichiana* (DC.) Baker.

Cassia montana Heyne ex Roth, Nov. Pl. Sp. 214. 1821; Gamble, Fl. Madras 402(284). 1919.

Shrubs. Leaves 12-15 cm long, eglandular; leaflets 8-12 pairs, oblong, to 3.5×1.5 cm. Stamens 6-7, subequal. Pod 12×1.5 cm.

South W. India. Locally common at Belvathally and Nagpuri (eastern plains). June-December. *CJS* 13218, *HFP* 2820.

Cassia occidentalis L., Sp. Pl. 377. 1753; Gamble, Fl. Madras 401(284). 1919.

Shrubby herbs. Leaves 12-15 cm long, with a gland at the base of the petiole; leaflets in 3-5 pairs, elliptic-ovate, acuminate, round at base, to 6×2 cm. Bracts ovate, acuminate. Stamens 6-7, 2 larger. Pod linear, turgid but compressed, 12×0.5 cm, pale brown at centre, pale yellow along the margin.

Tropics. Frequent on waste land across plains and in upper Ghats. A foetid undershrub. March-October. *CJS* 14315, *HFP* 2829.

Note: This species is similar to *C. sophera* L., which can be expected. The latter has 4-10-flowered raceme, peduncle more than 0.5 cm, short (4-5 mm) obtuse bracts, more but smaller leaflets, glabrescent pedicels and terete pods.

Cassia siamea Lam., Encycl. 1: 648. 1785; Gamble, Fl. Madras 402(285). 1919. *Cassia florida* Vahl, Symb. Bot. 3: 57. 1794; Bedd., Fl. Sylv. t. 179. 1872.

Trees. Leaves 12-18 cm long, eglandular; stipules 0; leaflets 8-12 pairs, elliptic-oblong, 6×2 cm, rounded. Corymbs in axillary and terminal panicles; bracts appendiculate on the back. 2 stamens larger. Pod 15-25×1 cm, flattened.

South E. Tropical Asia. Common across the plains and in upper Ghats. Frequently planted along the road. April-October. *CJS* 14298, *HFP* 2814.

Cassia surattensis N. Burman, Fl. Ind. 97. 1768; Backer & Bakh. f., Fl. Java 1: 538. 1963. *Cassia glauca* Lam., Encycl. 1: 647. 1785; Gamble, Fl. Madras 403(285). 1919.

Shrubs or small trees. Leaves 12-14 cm long, with clavate glands between the leaflets; leaflets in 4-6 pairs, elliptic-lanceolate, subacute, truncate at base, 8×3.5 cm. Bracts ovate, acuminate, reflexed. 2-3 stamens larger. Pod dehiscent, 15×1.2 cm.

Indomalaysia. Collected once near Belvathally on December 19, 1968. *CJS* 11984.

Cassia tora L., Sp. Pl. 376. 1753; Gamble, Fl. Madras 401(284). 1919.

Annual shrubby herb. Leaves 6-8 cm long, with subulate glands between the leaflets; leaflets in 3-5 pairs, 5×2.5 cm. Flowers in axillary pairs; bracts linear. Stamens 6-7. Pod apiculate, 12×0.5 cm, subtetragonal.

Tropics. Occasional in plains and upper Ghats. September-January. *CJS* 9287, 11966.

CYNOMETRAL innaeus

Trees. Leaves even-pinnate. Racemes often fasciculate. Stamens usually 10. Ovary usually stalked, sometimes adnate to hypanthium, 1-2-ovuled. Pod flat or turgid, woody, 1-seeded, indehiscent.

Cynometra bourdillonii Gamble, Bull. Misc. Inform. 446. 1908; Fl. Madras 414(293). 1919; Knaap-van Meeuwen, Blumea 18: 19. 1970.

Evergreen trees to 35 m. Leaf rachis 5 cm long; leaflets 3-paired, nearly similar, obliquely obovate, slightly retuse, cuneate, 2.5-4×1-1.8 cm; midrib eccentric. Peduncle 1 cm long. Petals crimson. Fruit smooth, globular, with a vertical groove, 1.3 cm across.

Endemic to S. Kanara & Hassan. Collected once in lower Bisle Ghat (200 m). November-January. *CJS* 16035.

Note: An interesting genus badly needing new collections in flower and fruit. This is one of the few collections of this species.

HUMBOLDTIA Vahl *nom. cons.*

Leaves even-pinnate; stipules foliaceous; leaflets sessile. Flowers irregular, subtended by 2 persistent, colored, gland-dotted bracts. Calyx lobes 4. Petals 3 or 5. Stamens 5, free, each alternating with a minute staminode. Ovary with stalk adnate to hypanthium, few-ovuled. Pod oblong, flat, oblique, continuous.

Humboldtia brunonis Wall., Pl. As. Rar. 3: 17, t. 233. 1832; Wight, Ic. t. 1605. 1850; Gamble, Fl. Madras 411(291). 1919.

Evergreen shrubs or trees. Stipules 3 cm long, with reniform basal appendage; upper part lanceolate, mucronate, strongly nerved beneath. Petiole absent; rachis 4 cm long; leaflets 2 pairs, oblanceolate, abruptly acuminate, 20×7 cm, coriaceous. Calyx pink. Petals 3, white, tinged with pink. Pod 5×2 cm, coriaceous.

Western Ghats. Occasional in lower Ghats. Flowering from December to June, fruiting March to January. *CJS* 10592, 15990.

KINGIODENDRON Harms

Leaves odd-pinnate; leaflets alternate. Sepals orbicular, petaloid. Petals absent. Ovary sessile, 1-ovuled. Pod woody, turgid, obliquely obovate, minutely beaked, 1-seeded, late dehiscent.

Kingiodendron pinnatum (DC.) Harms in Engl. & Prantl, Pflanzenfam. Nachtr. 1: 194. 1897; Gamble, Fl. Madras 412(292). 1919. *Hardwickia pinnata* Roxb. [Hort. Beng. 33. 1814, *nom.*] ex DC., Prodr. 2: 487. 1825; Bedd., Fl. Sylv. t. 255. 1872.

Evergreen trees over 20 m. Leaf rachis 12 cm long; leaflets 5-7, elliptic-oblong, acuminate, rounded, to 10×4 cm, shining. Pods dark brown, 4×2.5 cm.

Western Ghats. Occasional in lower Ghats. April-August. *HFP* 2847, 2871.

MEZONEURON Desfontaines

Prickly, climbing shrubs. Leaves bipinnate; pinnae 3-5 pairs. Calyx oblique, petaloid. Outer sepal hooded. Petals spreading, not exceeding calyx. Stamens declinate. Ovary shortly stipitate, few-many-ovuled. Pod oblong, flat, winged along the upper suture, indehiscent, 1-seeded.

Mezoneuron cucullatum (Roxb.) Wight & Arn., Prodr. 283. 1834; Gamble, Fl. Madras 395(280). 1919. *Caesalpinia cucullata* Roxb., [Hort. Beng. 32. 1814, *nom.*] Fl. Ind. 2: 358. 1832.

Stem with hooked thorns. Leaf rachis to 20 cm long; pinnae to 10 cm long; leaflets 4 pairs, elliptic-ovate, acuminate, rounded at base, to 10×5 cm. Panicle 25 cm long. Flowers yellow. Upper petal shorter, wider, 2-lobed; the rest suborbicular. Pod to 10×2.5 cm, creamy, tinged with red.

Indomalaysia. Occasional in Ghats. December-March. *CJS* 15832, *HFP* 1465.

Note: T. A. Hattink (*Reinwardtia* 9: 22. 1974) has merged *Mezoneuron* with *Caesalpinia.* Consequently the author reinstates *Caesalpinia cucullata* Roxb.

PTEROLOBIUM R. Brown ex Wight & Arn. *nom. cons.*

Armed, woody, often climbing. Leaves bipinnate. Hypanthium oblique, short. Sepals slightly unequal, hooded. Petals slightly unequal, equaling calyx. Stamens subdeclinate. Ovary sessile, 1-ovuled. Pod with terminal wing, indehiscent, 1-seeded.

Pterolobium hexapetalum (Roth) Sant. & Wagh, Bull. Bot. Surv. India 5: 108. 1964. *Reichardia hexapetala* Roth, Nov. Pl. Sp. 210. 1821. *Caesalpinia lacerans* Roxb., Fl. Ind. 2: 367. 1832. *Pterolobium indicum* A. Rich., Fl. Abyss. 1: 247. 1847; Gamble, Fl. Madras 395 (280). 1919. *Pterolobium lacerans* auct. non R. Br. ex Wight & Arn., 1834; Wight, Ic. t. 196. 1839.

Leaf rachis 12-15 cm long, pubescent with shorter prickles; pinnae 6-8 pairs, 2-3 cm long; leaflets 4-6 pairs, oblong, obtuse or retuse at apex, to 1×0.7 cm. Calyx rose. Corolla yellowish-white. Pod pinkish-red, to 5×1 cm.

South W. India. Common in scrub. May-September. *CJS* 13532, *HFP* 2828.

Note: The citation of the type species in the list of conserved names (*ICBN* 315. 1972) is misleading because it includes a reference to Roxburgh. Wight and Arnott (*Prodr.* 183. 1834) adopted the invalidly published name of R. Brown which refers to an African plant but described an Indian plant and cited *Caesalpinia lacerans* Roxb. (1832). Thus it is difficult to know whether *Pterolobium lacerans* refers to an Indian or an African taxon. If it does refer to an African plant then the reference to Roxburgh should be deleted (as recommended by the Committee for Conserved Names, *Taxon* 19: 292. 1970). If it refers to an Indian plant then all references to Gmelin should be deleted. In any case it is anomalous that the name of an African species can be considered as validated by the description of a completely different Indian species.

SARACA Linnaeus

Trees. Leaves even pinnate. Bracteoles 2 at the base of calyx tube, colored. Calyx petaloid, hypanthium long; lobes 4, subequal. Petals 0. Stamens 3-8, free. Ovary stalked, stipe adnate to hypanthium, many-ovuled. Pod oblong, flat, coriaceous or woody, dehiscent.

Saraca asoca (Roxb.) de Wilde, Blumea 15: 393. 1968; Zuijderhoudt, Blumea 15: 422. 1968. *Jonesia asoca* Roxb., Asiat. Res. 4: 365. 1795; Wight, Ic. t. 206. 1839. *Saraca indica* auct. non L.: Bedd., Fl. Sylv. t. 57. 1870; Gamble, Fl. Madras 409(289). 1919.

Petiole 25 cm long; leaflets 4 pairs, ovate-oblong, acuminate, to 25×7 cm. Panicle 5 cm long, 10 cm broad, orange-yellow, pink with age. Bracteoles erect, embracing the calyx tube, larger than bract. Calyx lobes half the length of the tube. Stamens 6-8. Pod 5-15×2-5 cm, flat to turgid, shortly apiculate.

Indomalaysia. Rare in wet deciduous forest of Shiradi Ghat. All seasons, but no fruits. *CJS* 10098, 16171.

Note: De Wilde separates *Saraca asoca* from *S. indica* on the basis of clasping and spreading bracteoles. Our experience indicates that specimens with clasping bracteoles may appear to have spreading bracteoles after pressing. Further studies on fresh material are indicated.

TAMARINDUS Linnaeus

Leaves even-pinnate. Raceme terminating short branchlets. Flowers irregular; pedicels articulate with the calyx tube. Hypanthium turbinate; lobes 4. Petals 3, upper hooded, laterals ovate. Stamens 3, monadelphous; staminal sheath hairy at base, cleft above; staminodes few, minute, at apex of sheath. Ovary with stalk adnate to hypanthium, many-ovuled. Pod oblong, subcylindrical, pulpy within, continuous, indehiscent, many-seeded.

Tamarindus indica L., Sp. Pl. 34. 1753; Bedd., Fl. Sylv. t. 184. 1872; Gamble, Fl. Madras 409(290). 1919.

Evergreen trees. Leaf rachis 10-15 cm long; leaflets 14-16 pairs, oblong, obtuse, oblique at base, to 2×0.6 cm. Raceme short. Corolla yellow, striped with pink. Pod pale brown, 15×2 cm.

Tropics. Frequent in dry plains along the road. Cultivated extensively. Leaflets and fruit-pulp acidic. April-September. *CJS* 8981, 13513.

WAGATEA Dalzell

Prickly climbing shrubs. Leaves bipinnate; pinnae 4-6 pairs; leaflets 5-7 pairs. Raceme subspicate, sometimes panicled, elongate. Calyx petaloid; hypanthium short, campanulate; lobes lanceolate, outer slightly larger. Uppermost petal slightly broader, equaling sepals. Stamens 10, free, alternately long and short, slightly declinate. Ovary stalked, many-ovuled. Pod ligulate or oblong, subtorulose, few-seeded, indehiscent; sutures thickened.

Wagatea spicata Dalzell, Hooker's J. Bot. Kew Gard. Misc. 3: 90. 1851; Wight, Ic. t. 1995. 1853; Gamble, Fl. Madras 397(281). 1919.

Leaf rachis 25-30 cm long; pinnae 8-12 cm long; leaflets obliquely oblong, subacute or rounded at apex, to 4×2 cm. Raceme 40-50 cm long, subspicate, narrow; peduncle stout. Calyx red. Corolla yellow. Pod 8×1.5 cm, 2-4-seeded.

South W. India. Frequent in lower Ghats. November-April. *CJS* 12132, *HFP* 2540. (Plate 4).

* * *

Delonix regia (W. Hooker) Raf. with red flowers (March to July) is a commonly planted avenue tree. *Parkinsonia aculeata* L., a small tree with flattened secondary rachises and deciduous leaflets is grown as a curiosity.

Subfamily 2. MIMOSOIDEAE

Leaves usually bipinnate, often glandular on rachis. Flowers sometimes polygamous, 4-5-merous, in dense heads or spikes. Sepals usually valvate and connate. Petals valvate, often connate. Stamens often many, free or united. Style straight.

1 Inflorescence a spike.
2 Climber with tendrils, unarmed; pods jointed.....**Entada**
2 Trees or shrubs, usually armed, if climbers without tendrils and armed; pod not jointed.
3 Secondary leaf rachises 1-2; stamens 10.....**Prosopis**
3 Secondary leaf rachises 5-more; stamens many.....**Acacia**
1 Inflorescence capitate or subumbellate.
4 Pod jointed; stamens 10 or fewer.....**Mimosa**
4 Pod not jointed; stamens 10 or more.
5 Stamens 10; fruit falcate, woody; leaflets 4, acute.....**Xylia**
5 Stamens numerous; fruit straight or coiled, coriaceous; leaflets 10 or more or when 4, obtuse.
6 Stamens free; plant usually armed.....**Acacia**
6 Stamens united below; plants unarmed except when leaflets 4.
7 Pod thin, straight.....**Albizia**
7 Pod turgid, coiled.....**Pithecellobium**

ACACIA P. Miller

Usually woody and armed. Leaves bipinnate; rachis often glandular; leaflets numerous, linear. Flowers many, sometimes polygamous in spikes or heads. Calyx campanulate, lobed or toothed. Petals united. Stamens many. Ovary usually many-ovuled. Pod usually oblong, flat.

1 Stem with prickles, without any stipular spines.
2 Leaflets more than 2 mm broad, truncate at base. (Petiole gland near base, conical).....*A. torta*

2 Leaflets less than 2 mm broad, semi-truncate at base. (Petiole gland not conical).
3 Pod thick, fleshy. Leaflets less than 30 pairs, pubescent at first, then glabrous, Petiole gland globular (near middle).....*A. sinuata*
3 Pod thin, dry. Leaflets more than 30 pairs, glabrous. Petiole gland oblong.
4 Gland at or above the middle of petiole. Flowers sessile.....*A. megaladena*
4 Gland below the middle of the petiole. Flowers pedicelled.....*A. pennata*
1 Stem with stipular spines (sometimes very minute), without prickles.
5 Flowers in elongate, cylindrical spikes.
6 Plants pubescent.....*A. polyacantha*
6 Plants glabrous.
7 Spines straight, over 1 cm long; leaflets more than 2 mm broad (less than 20 pairs).....*A. ferruginea*
7 Spines recurved, less than 0.5 cm long; leaflets less than 1 mm broad (more than 20 pairs).....*A. chundra*
5 Flowers in heads.
8 Heads in terminal panicles.....*A. leucophloea*
8 Heads (on axillary peduncles) solitary or fascicled.
9 Pod cylindric. Rachis less than 5 cm long; petiole gland near middle; rachis eglandular; peduncle with a ring of bracts at the tip (in buds). Heads fragrant .....*A. farnesiana*
9 Pod moniliform. Rachis more than 5 cm long; petiole gland near first pinnae; rachis with several glands; peduncles 2-bracteate above the middle (deciduous). Heads not fragrant.....*A. nilotica*

Acacia chundra (Rottler) Willd., Sp. Pl. 4: 1078. 1806; Bedd., Fl. Sylv. t. 50. 1870 (‘*sandra*’); Gamble, Fl. Madras 428(303). 1919 (‘*sundra*’) *Mimosa chundra* Roxb. ex Rottler, Ges. Naturf. Freunde Berlin Neue Shriften 4: 207. 1803; Roxb., Pl Cor. t. 225. 1811 (‘*sundra*’)

Small tree. Leaves 8-10 cm long; stipular spines hooked; rachis with small gland between the upper pinnae; petiole gland at the base of 1st pairs of pinnae; pinnae 10-20 pairs, 2-2.5 cm long; leaflets in 30-40 pairs, to 3×0.8 mm. Spike 6-8 cm long. Corolla white, thrice as long as calyx. Pod stalked, 6×1 cm, subacute, 3-4-seeded.

South W. India, Sri Lanka, Burma. Frequent in scrub across plains. Flowering April-September, fruiting August-January. *CJS* 12382, 13207.

Note: The correct spelling of the epithet was discussed by Chatterjee (*Sci. & Cult.* 14: 290-291. 1949). We maintain Rottler’s and Willdenow’s original and more correct form.

Acacia farnesiana (L.) Willd., Sp. Pl. 4: 1083. 1806; Bedd., Fl. Sylv. t. 52. 1870; Gamble, Fl. Madras 425-(301). 1919. *Mimosa farnesiana* L., Sp. Pl 521. 1753. *Vachellia farnesiana* (L.) Wight & Arn., Prodr. 272. 1834; Wight, Ic. t. 300. 1840.

Shrubs or small trees. Leaves 5 cm long; stipular spines straight; pinnae 5-7 pairs, 2 cm long; leaflets in 15-20 pairs. Head 1.2 cm across; peduncle 3-4 cm long. Corolla yellow, twice as long as calyx. Pod

entire, dehiscent, 6 cm long, 1 cm thick, obtuse at apex, slightly curved, faintly striate, 4-6-seeded.

Tropics. Occasional in scrub of plains. August-March. *CJS* 12309, 16573.

Acacia ferrguinea DC., Prodr. 2: 458. 1825; Bedd., Fl. Sylv. t. 51. 1870; Gamble, Fl. Madras 428(303). 1919. *Mimosa ferruginea* (DC.) Roxb., [Hort. Beng. 41. 1814, *nom.*] Fl. Ind. 2: 561. 1832, non Rottler, 1803.

Deciduous trees to 10 m. Leaves 8 cm long; stipular spines minute; petiole gland above the middle; pinnae of 4-6 pairs, 6 cm long, upper ones with glands between them; leaflets in 16-20 pairs, 8×2.5 mm, glaucous. Spike 14 cm long. Corolla white, 2-3 times as long as calyx. Pod slightly wavy and thick, 11×2.5 cm, apiculate, 5-7-seeded.

South W. India. Collected once in flower and fruit (previous season) in scrub along Arkalgud-Holenarsipur road on April 9, 1970. *CJS* 16718.

Acacia leucophloea (Roxb.) Willd., Sp. Pl. 4: 1083. 1806; Bedd., Fl. Sylv. t. 48. 1870; Gamble, Fl. Madras 427(302). 1919. *Mimosa leucophloea* Roxb., Pl. Cor. t. 150. 1800.

Deciduous trees to 7 m. Leaves 7 cm long, hispid; stipular spines slightly hooked; petiole gland near middle; rachis with gland between all the pinnae; pinnae of 8-10 pairs, 2.5 cm long; leaflets in 20-25 pairs, 4×1 mm. Peduncle 15-25 cm long; heads 0.8 cm across. Corolla yellowish-white, twice as long as calyx. Pod slightly turgid, oblong, entire, obtuse, tomentose, slightly curved, depressed between seeds on the outside, 8×1 cm, 10-12 seeded.

Indomalaysia. Occasional in dry deciduous forests of plain. August-February. *CJS* 14366, *HFP* 2341.

Acacia megaladena Desvaux, J. Bot. 3: 69. 1814 ('*megalodena*'); Brenan & Exell, Year Book Bot. Soc. Brit. Isles ser. 24, 31: 102. 1957. *Acacia arrophula* D. Don, Prodr. Fl. Nepal. 247. 1825. *Acacia pennata* var. *arrophula* (D. Don) Baker in J. Hooker, Fl. Brit. India 2: 298. 1878.

Prickly stragglers. Leaves 10 cm long, dull, glabrous; pinnae of 10-14 pairs, 6 cm long; upper ones with glands in between; leaflets in 50-60 pairs, 5×1 mm. Panicle 15-20 cm long; heads 1.4 cm across. Corolla white, a little longer than calyx. Pod strap-shaped, 15-20×2-3 cm, dehiscent, stalked, 8-10-seeded.

India. Frequent in dry deciduous to wet deciduous forests. August-December. *CJS* 9020, 14644.

Acacia nilotica (L.) Willd. ex Delile, Fl. Aegypt. Ill. 79. 1813. *Mimosa nilotica* L., Sp. Pl. 521. 1753.

ssp. **indica** (Bentham) Brenan, Kew Bull. 12: 84. 1957; Sant., Fl. Khandala ed. 3, 83. 1967. *Acacia arabica* auct. non (Lam.) Willd., 1808; Bedd., Fl. Sylv. t. 47. 1870; Gamble, Fl. Madras 425(301). 1919. *Acacia arabica* var. *indica* Bentham, London J. Bot. 1: 500. 1842. *Acacia nilotica* var. *indica* (Bentham) Hill, Bot. Mus. Leafl. Harvard Univ. 8: 9. 1940.

Trees to 7 m. Stipular spines straight, 5 cm long. Rachis grey pubescent, 7 cm long; pinnae 7 pairs, 3.5 cm long; leaflets in 18-25 pairs, 5×1.2 cm. Head 1 cm across; peduncle 3 cm long. Corolla yellow, thrice as long as calyx. Pod distinctly stalked, grey pubescent, moniliform, 15×1.5 cm, 10-12-seeded.

Paleotropics. Occasional in scrub in plains. Flowers March-August; fruiting June-April. *CJS* 12398, 16716.

Acacia pennata (L.) Willd., Sp. Pl. 4: 1090. 1806; Gamble, Fl. Madras 429(304). 1919. *Mimosa pennata* L., Sp. Pl. 522. 1753.

Prickly, glabrescent, climbing shrubs or small trees. Leaves 10 cm long; rachis with glands between upper pinnae; pinnae of 12-15 pairs, 6 cm long; leaflets in 50-60 pairs, 6×1 mm, semi-truncate at base. Panicle 10-15 cm long; heads 1-2 cm across. Corolla white, slightly longer than calyx. Pod strap-shaped.

Paleotropics. Frequent in scrub of plains. June-November. *CJS* 17926, *HFP* 2815.

Acacia polyacantha Willd., Sp. Pl. 4: 1079. 1806; Sant., Fl. Khandala ed. 3, 84. 1967. *Mimosa suma* Roxb., Fl. Ind. 2: 563. 1832. *Acacia suma* (Roxb.) Ham. ex Voigt, Hort. Sub. Calc. 260. 1845; Gamble, Fl. Madras 627(303). 1919.

White-pubescent trees. Leaves 12 cm long; stipular spines straight, 0.5 cm long; petiole gland near middle, large; pinnae 15-18 pairs, 5 cm long, with glands between them; leaflets in 50-60 pairs, 3×0.5 cm. Spike 12 cm long. Corolla white, little longer than calyx. Pod 10-15×1.5 cm, slightly thick, apiculate, indehiscent, many-seeded.

India, Sri Lanka. Collected once in flower on dry wasteland in Hassan on April 27, 1965. *CJS* 9521.

Acacia sinuata (Lour.) Merrill, Trans. Amer. Philos. Soc. 24(2): 186. 1935; Sant., Fl. Khandala ed. 3, 84. 1967. *Mimosa rugata* Lam., Encycl. 1: 20. 1783. *Mimosa sinuata* Lour., Fl. Cochinch. 653. 1790. *Mimosa concinna* Willd., Sp. Pl. 4: 1039. 1806. *Acacia concinna* (Willd.) DC., Prodr. 2: 464. 1825; Gamble, Fl. Madras 429(304). 1919. *Acacia rugata* Ham. [in Wall., List 5251. 1832, *nom.*] ex Bentham, London J. Bot. 1: 514. 1842. *Acacia concinna* var. *rugata* (Bentham) Baker in J. Hooker, Fl. Brit. Ind. 2: 297. 1878. *Acacia rugata* (Lam.) Merrill, Philipp. J. Sci. Bot. 5: 28. 1910, non Bentham,

1842; Gamble, Fl. Madras 429(304). 1919; Fawcett & Rendle, Fl. Jam. 4: 141. 1920; Raizada, Indian Forester 92: 300. 1966; Backer & Bakh. f., Fl. Java 1: 556. 1963; Adams, Fl. Pl. Jamaica 335. 1972.

Prickly climbing shrubs or small trees with brown pubescence. Leaves 10 cm long; pinnae of 6-9 pairs, 3.5 cm long, uppermost pair with a gland in between; leaflets in 20-25 pairs, 8×1.3 mm. Heads 1 cm across; corolla white, 1.5 times as long as calyx. Ovary sparsely pubescent. Pod 15×2.5 cm, rugose, wrinkled when dry, often indented on sutures, depressed between seeds, 10-14-seeded.

Indomalaysia, China. Common in dry deciduous to wet deciduous forests. Flowering January-April; fruiting November-February. *CJS* 12493, 16301. The powdered pods are used as a substitute for soap.

Note: The above handling of the nomenclature of this taxon proceeds from the fact that Bentham's (1842) publication of *Acacia rugata* is based solely on Hamilton's specimen, not Sonnerat's specimen which is the type of Lamarck's *Mimosa rugata* i.e., although the specific epithets are the same, Bentham's *Acacia rugata* is a new taxon, not a new combination based on *Mimosa rugata* Lam. Thus *Acacia rugata* (Lam.) Merrill is a later homonym.

Acacia torta (Roxb.) Craib, Bull. Misc. Inform. 410. 1915; Gamble, Fl. Madras 428(304). 1919. *Mimosa torta* Roxb., Fl. Ind. 2: 566. 1832. *Acacia caesia* auct. non Willd.: Wight and Arn., Prodr. 278. 1834.

Prickly shrubs or small trees. Leaves 10 cm long; rachis with few glands between upper pinnae; pinnae of 8-12 pairs, 5 cm long; leaflets in 25-30 pairs, truncate at base, 5×2.5 mm, pubescent beneath, rarely reduced to phyllodes. Heads 0.8 cm across; bracts stipuliform. Corolla white, twice as long as calyx. Pod 12×1.2 cm, slightly wavy or not, glabrescent, 5-7-seeded.

Paleotropics. Frequent in dry deciduous to wet deciduous forests. Flowering March-June; fruiting August-March. *CJS* 16728, *HFP*1606.

ALBIZIA Durazzini

Unarmed trees. Leaves bipinnate; rachis glandular. Flowers usually capitate. Calyx shortly lobed. Petals united. Stamens 12-many, monadelphous. Ovary sessile or not, many-ovuled. Pod strap-shaped, thin, continuous, subindehiscent.

1 Pinnae more than 6 pairs; leaflets less than 1 cm long.
2 Stipules minute; leaflets rounded at apex; midrib nearly central.....*A. amara*
2 Stipules foliaceous; leaflets acute at apex; midrib eccentric.....*A. chinensis*
1 Pinnae less than 6 pairs; leaflets more than 1 cm long.
3 Flowers pedicelled. Umbels not in panicles. Pod straw-colored.....*A. lebbeck*
3 Flowers sessile. Heads in panicles. Pod brown.....*A. odoratissima*

Albizia amara (Roxb.) Boivin, Encycl. 19 Siecle 2: 34. 1838; Bedd., Fl. Sylv. t. 61. 1870; Gamble, Fl. Madras 432(306). 1919. *Mimosa amara* Roxb., Pl. Cor. t. 122. 1799.

Deciduous; branchlets, leaf rachis pubescent. Leaf 12 cm long; rachis with glands between the lower pinnae and on the petiole; pinnae 8-12 pairs, 5 cm long; leaflets 16-25 pairs, 6×2 mm, membranous, sparsely pubescent. Heads 1-few-fascicled, 2 cm across. Flowers subsessile. Corolla yellowish-white, thrice as long as calyx. Pod greyish-brown, faintly veined, 20×4 cm.

South W. India, Sri Lanka, Africa. Frequent in dry deciduous or scrub. Flowering March-May; fruiting June-January. *CJS* 10842, 16487.

Albizia chinensis (Osb.) Merrill, Amer. J. Bot. 3: 575. 1916; Sant., Fl. Khandala ed. 3, 86. 1967. *Mimosa chinensis* Osbeck, Dag. Ostind. Resa 233. 1757. *Mimosa marginata* Lam., Encycl. 1: 12. 1783. *Mimosa stipulata* Roxb., [Hort. Beng. 40. 1814, *nom.*] Fl. Ind. 2: 549. 1832 ('*stipulacea*'). *Albizia stipulata* (Roxb.) Boivin, Encycl. 19 Siecle 2: 33. 1838; Bedd., Fl. Sylv. t. 55. 1870. *Albizia marginata* (Lam.) Merrill, Philipp. J. Sci. Bot. 5: 23. 1910. Gamble, Fl. Madras 433(307). 1919.

Branchlets, rachis, inflorescence yellow-pubescent. Leaves 14 cm long; rachis with several glands in addition to one on the petiole; pinnae 10 pairs, 7 cm long; leaflets 35-40 pairs, pubescent on the petiole, 6×1.5 mm, with eccentric midribs. Heads in panicles, 2.5 cm across. Corolla pinkish-white, 2-3 times as long as calyx. Pod brown, 20×3 cm.

Indomalaysia. Fairly common in wet deciduous forests. Flowering March-May; fruiting September-April. *CJS* 13268, 16775.

Albizia lebbeck (L.) Willd., Sp. Pl. 4: 1066. 1806; Gamble, Fl. Madras 432(306). 1919. *Mimosa lebbeck* L., Sp. Pl. 516. 1753.

Young parts pubescent. Leaves 7 cm long; rachis with a gland near the base of the petiole and one below the uppermost pinnae; pinnae usually 2 pairs, 7 cm long; leaflets 3-4 pairs, obliquely oblong, retuse or obtuse at apex, 4×2.5 cm, shining, with eccentric midrib. Heads 1-few-fascicled, 4 cm across; flower sessile. Corolla white, twice as long as calyx. Pod 35×5 cm.

Paleotropics. Frequent in plains and upper Ghats. Flowering January-August; fruiting April-November. *CJS* 14621, *HFP* 2704.

Albizia odoratissima (L. f.) Bentham, London J. Bot. 3: 88. 1844; Bedd., Fl. Sylv. t. 54. 1870; Gamble, Fl. Madras 431(306). 1919. *Mimosa odoratissima* L. f., Suppl. 437. 1781.

Leaves 12 cm long, pubescent; rachis with a gland on the petiole as well as at its tip; pinnae 4 pairs, 10 cm long; leaflets 12-18 pairs, obliquely

oblong, obtuse at apex, with the midrib near upper margin, 2×0.6 cm. Panicle large, downy; heads 2 cm across; flowers pedicelled. Corolla white, 4 times as long as calyx. Pod 12×2.5 cm.

Indomalaysia. Frequent in dry to wet deciduous forests. Flowering April-June; fruiting July-January. *CJS* 16723, *HFP* 1605.

ENTADA Adanson *nom. cons.*

Leaves bipinnate; pinnae 2 or 4; rachis usually ending in 2 tendrils; leaflets 3-4 pairs. Flowers spicate, often polygamous. Calyx toothed. Petals 5, free or slightly cohering. Anthers tipped with a deciduous gland. Ovary subsessile, many-ovuled. Pod very large, woody, slightly curved, compressed, separating into 1-seeded joints.

Entada pursaetha DC., Mem. Leg. 12. 1825 (Oct.); Sant., Fl. Khandala ed. 3, 82. 1967. *Entada scandens* auct. non Bentham, 1841: Gamble, Fl. Madras 417(296). 1919.

Liana. Leaf rachis 15 cm long; pinnae 10 cm long; leaflets oblong-obovate, subacute, to 6×2.5 cm. Spike to 30 cm long. Corolla yellowish-white, twice as long as calyx. Pod brown, 40×9 cm.

Western India, Africa. Fairly common in semi-evergreen to wet deciduous forests. March-October. *CJS* 12643, 12840.

MIMOSA Linnaeus

Leaves bipinnate; pinnae stipellate. Heads 1-few; bracteoles persistent. Flowers sometimes polygamous. Calyx minute. Petals united. Stamens as many as or twice the number of petals. Ovary sessile, few-ovuled. Pod compressed, oblong; valves separating from persistent margins; joints 1-seeded.

Mimosa pudica L., Sp. Pl. 518. 1753; Gamble, Fl. Madras 421(298). 1919.

Prickly, woody herbs. Petiole 3-5 cm long; pinnae in 1 pair or 2 subdigitate pairs, 4 cm long; leaflets 12-14 pairs, linear, to 1×0.3 cm. Head to 1.5 cm across. Petals 4. Stamens pink, 4. Pod 2-5-jointed, 3×0.4 cm; margins distinctly bristly.

Tropical America. Introduced and run wild on wasteland in plains and upper Ghats. All seasons. The leaflets are sensitive, and close upon being touched. *CJS* 9216, 13740.

PITHECELLOBIUM Martius

Usually trees. Leaves bipinnate, usually glandular. Heads often

panicled. Calyx toothed. Petals united above middle. Stamens few-many, monadelphous. Ovary subsessile, many-ovuled. Pod strap-shaped, falcate or twisted; seeds exalbuminous.

1 Stipules spiny; leaflets in one pair, small, obtuse at apex.....*P. dulce*
1 Stipules small; leaflets in 3 or more pairs, large, cuspidate.....*P. monadelphum*

Pithecellobium dulce (Roxb.) Bentham, London J. Bot. 3: 199. 1844; Gamble, Fl. Madras 434(308). 1919. *Mimosa dulcis* Roxb., Pl. Cor. t. 99. 1798. *Inga dulcis* (Roxb.) Willd., Sp. Pl. 4: 1005. 1806; Wight, Ic. t. 198. 1839.

Large trees armed with stipular spines. Petiole 2.5 cm long, with a gland at the tip; pinnae 2, short, each with a gland at the tip; leaflets 2 per pinna, obliquely oblong, obtuse at both ends, to 4×2 cm. Calyx to 1.3 mm. Corolla white, 3-4 mm. Stamens white. Pod spiral, moniliform, 1-2×1 cm.

Introduced from Tropical America. Occasional in scrub. February-April. *CJS* 9517, 16440. The white aril surrounding the seed is edible.

Pithecellobium monadelphum (Roxb.) Koster., Reinwardtia 3: 11. 1954. *Mimosa monadelpha* Roxb., Fl. Ind. 2: 544. 1832. *Pithecellobium bigeminum* auct. non (L.) Mart. ex Bentham, 1844: Gamble, Fl. Madras 435(308). 1919 ('*Pithecolobium*').

Unarmed trees. Petiole 3-4 cm long, with a gland above the middle; pinnae 1-2 pairs, 10 cm long, usually with glands between all leaflets; leaflets 3-4 pairs, elliptic-ovate, rounded at base, to 13×4.5 cm. Corolla white. Pod circinate, acute at apex, 8×1.5 cm, brown outside, orange-red within; seeds black.

South W. India, E. Himalayas. Frequent in semi-evergreen to wet deciduous forests. January-April. *HFP* 248, 2671.

PROSOPIS Linnaeus

Leaves bipinnate, eglandular. Inflorescence usually spicate. Flowers sometimes polygamous. Calyx faintly toothed. Petals at first connate below middle. Anthers with a deciduous gland. Ovary subsessile, many-ovuled. Pod oblong, slightly turgid, indehiscent, entire or slightly wavy, septate within.

Prosopis cineraria (L.) Druce, Bot. Exch. Club Soc. Brit. Isles 3: 422. 1914. *Mimosa cineraria* L., Sp. Pl. 517. 1753 ('*cinerea*'). *Prosopis spicigera* L., Mant. 68. 1767; Roxb., Pl. Cor. t. 63. 1796; Bedd., Fl. Sylv. t. 56. 1870; Gamble, Fl. Madras 419(297). 1919.

Armed trees. Petiole to 3 cm long; pinnae usually 2 pairs, 6 cm long; leaflets 15-20 pairs, oblong, obtuse, to 1.5×0.3 cm. Spikes 1-few-

fascicled, to 9 cm long. Flowers cream. Pod 8×1 cm, straight, slender, glabrous.

Southeast Asia. Occasional in dry deciduous forests. September-April. *CJS* 16622, 16632.

XYLIA Bentham

Leaves bipinnate, with glands at the tip of the petioles and on the rachis between leaflets; pinnae 2; often the lowest leaflet odd and unopposed. Heads usually in racemes. Calyx dentate. Petals slightly connate at base. Stamens 10-many; anthers tipped with a stalked, deciduous gland. Ovary sessile, many-ovuled. Pod falcate, woody, flat, septate, late dehiscent by valves recurving from apex.

Xylia xylocarpa (Roxb.) Taub., Bot. Centralbl. 47: 397. 1891; Gamble, Fl. Madras 417(295). 1919. *Mimosa xylocarpa* Roxb., Pl. Cor. t. 100. 1798. *Xylia dolabriformis* Bentham, J. Bot. (Hooker) 4: 417. 1842; Bedd., Fl. Sylv. t. 186. 1872.

Unarmed, deciduous trees. Petiole 3-5 cm long; pinnae 7-9 cm long; leaflets 3-5 pairs, elliptic-lanceolate, acuminate, upper larger, to 9×3.5 cm. Corolla yellowish-white. Stamens 10. Pod brown pubescent, 15×4.5 cm, axe-shaped.

Indomalaysia. Fairly common in semi-evergreen forest at Shiradi border (lower Ghat). August-December. *HFP* 1245, 2538. A valuable timber tree.

* * *

Samanea saman (Jacq.) Merrill (The Rain Tree), a large tree with pink flowers and straight pods, is commonly grown as an avenue tree.

Subfamily 3. FABOIDEAE

Leaves usually odd-pinnate. Flowers usually bisexual and 5-merous. Sepals imbricate and connate. Petals imbricate, differentiated: the upper (outermost) petal suborbicular (vexillum or standard), the lateral pair (alae or wings) oblong, the lower and inner most pair slightly upcurved, often connate by lower margin (carina or keel). Stamens often diadelphous (9+1 or 5+5). Style usually with a sharp bend.

1 Leaves even-pinnate.
2 Stipules basifixed; climbers ..... **Abrus**
2 Stipules peltate or extended below attachment.
3 Leaflets in 9 or more pairs; stamens 5+5 ..... **Smithia**
3 Leaflets in 1-2 pairs; stamens monadelphous.

4 Leaflets in 2 pairs; bracts covering flowers.....**Geissaspis**
4 Leaflets in 1 pair; bracts not covering flowers.....**Zornia**
1 Leaves all odd-pinnate, digitate or unifoliolate.
5 Hairs centrifixed.....**Indigofera**
5 Hairs basifixed or none.
6 Venation striate.....**Tephrosia**
6 Venation reticulate.
7 Leaflets 5 or more.
8 Leaflets alternate, if opposite, then pod with a circular wing.
9 Leaflets less than 4 cm long; pod flat, unwinged.....**Dalbergia**
9 Leaflets more than 5 cm long; pod turgid, with a circular wing.....
.....**Pterocarpus**
8 Leaflets opposite; pod without a circular wing.
10 Leaflets silky-pubescent below.....**Mundulea**
10 Leaflets not silky-pubescent below.
11 Leaflets less than 3 mm across.....**Aeschynomene**
11 Leaflets over 1 cm across.
12 Herbs, twining.....**Clitoria**
12 Woody climbers or trees.
13 Calyx deeply lobed; stamens free; pods dehiscent; seeds red....**Ormosia**
13 Calyx truncated; stamens mon- or diadelphous; pods indehiscent; seeds brown.....**Derris**
7 Leaflets 1 or 3.
14 Leaves unifoliolate or digitately 3-foliolate.
15 Leaflets gland-dotted.
16 Flowers in pairs or lax racemes; ovules 3-more.....**Atylosia**
16 Flowers in dense racemes or heads; ovules 1-2.....**Flemingia**
15 Leaflets not gland-dotted.
17 Stamens monadelphous.
18 Stamens minute, uniform; pod linear, compressed.....**Rothia**
18 Stamens alternately short and long; pod inflated or turgid.....**Crotalaria**
17 Stamens diadelphous (9+1).
19 Stipules herbaceous, deciduous; pods not jointed.....**Atylosia**
19 Stipules scarious, subpersistent; pods jointed.
20 Calyx scarious; joints of pod turgid.....**Alysicarpus**
20 Calyx herbaceous; joints of pod flat.....**Desmodium**
14 Leaves pinnately 3-foliolate.
21 Standard 2.5 cm long or more.
22 Climbers; keel longer than standard; calyx and pod with irritating bristles
.....**Mucuna**
22 Erect trees or shrubs; keel equaling or shorter than standard; calyx and pod not irritating.
23 Standard and keel equal; pod flat with 1 seed.....**Butea**
23 Standard longer than keel; pod torulose, several-many seeded.....
.....**Erythrina**
21 Standard less than 2.5 cm long.
24 Leaflets armed at apex with mucro; flowers and fruits concealed in upper leaves.....**Stylosanthes**
24 Leaflets unarmed, sometimes apiculate; flowers and fruits not concealed in upper leaves.
25 Fruit jointed or depressed between seeds.

26 Pod horizontally jointed; stipules scarious.....**Desmodium**
26 Pod obliquely grooved; stipules herbaceous.....**Cajanus**
25 Fruit not jointed.
27 Ovules and seeds 1-2; calyx deeply lobed.
28 Calyx strongly accrescent; lowest sepal longest, boat-shaped.....
.....**Paracalyx**
28 Calyx slightly accrescent; lowest sepal undifferentiated.....**Rhynchosia**
27 Ovules and seeds 3 or more; calyx not deeply lobed.
29 Pod inflated, few-seeded.....**Pycnospora**
29 Pod flat, many-seeded.
30 Calyx obliquely truncate at apex, gibbous at base.....**Dumasia**
30 Calyx toothed, not gibbous.
31 Style hairy.
32 Style hairs in tuft at apex; keel without pocket.....**Dolichos**
32 Style hairs lateral; keel with lateral pocket.....**Vigna**
31 Style glabrous.
33 Pedicels over 0.5 cm; fruits viscid; leaflets usually crenate.....
.....**Pseudarthria**
33 Pedicels less than 0.5 cm; fruits not viscid; leaflets entire.
34 Inflorescence densely flowered; fruits less than 1 cm apart on lower half of inflorescence.
35 Leaflets 3-nerved; fruits twisting, septate; stipules and bracts inconspicuous, deciduous.....**Glycine**
35 Leaflets with 1 midrib; fruits straight, continuous; stipules and bracts conspicuous, persistent.....**Shuteria**
34 Inflorescence loose-flowered; fruits more than 1 cm apart on lower half of inflorescence.
36 Stamens monadelphous; 5 anthers fertile; ovary and pod with beaked style.....**Teramnus**
36 Stamens diadelphous; anthers all fertile; ovary and pod with straight style.....**Galactia**

ABRUS Adanson

Usually climbers. Leaves even-pinnate; leaflets in many pairs. Flowers few-fascicled on short outgrowths of raceme axis. Calyx shortly toothed. Standard auricled. Stamens 9, monadelphous. Ovary subsessile, many-ovuled. Pod oblong, compressed, subcontinuous; seeds arillate.

1 Leaflets more than 2 cm long. Seeds ellipsoid-globose, usually red and black....
.....*A. precatorius*
1 Leaflets less than 2 cm long. Seeds markedly compressed, black or brown.....
.....*A. pulchellus*

Abrus precatorius L., Syst. Nat. ed. 12, 472. 1767; Gamble, Fl. Madras 349(247). 1918; Verdcourt, Kew Bull. 24: 240. 1970.

Leaf rachis 8 cm long; leaflets in 12-16 pairs, to 1.5×0.5 cm. Raceme shorter than leaves. Corolla white, tinged with pink. Pod thick, hard, wrinkled, 3.5×1.2 cm. Seeds red with a black spot.

Tropics. Common in dry deciduous forests. September-January. *CJS* 12168, 15358.

Note: The bright and poisonous seeds are used as jewellers' weights.

Abrus pulchellus Wall. ex Thwaites, Enum. 91. 1859; Gamble, Fl. Madras 350(247). 1918; Verdcourt, Kew Bull. 24: 246. 1970.

Leaf rachis 12 cm long; leaflets in 9-12 pairs, to 4×1.3 cm. Raceme longer than leaves. Corolla rose. Pod thin, flat, smooth, 6×1.2 cm. Seeds dark brown.

Indomalaysia, China. Locally common in semi-evergreen forest at Kempuhole (lower Shiradi Ghat). Fruits December. *CJS* 15851.

AESCHYNOMENE Linnaeus

Herbs or shrubs. Leaves odd-pinnate; leaflets estipellate, numerous, linear. Raceme usually few-flowered, axillary; bracteoles appressed to calyx. Flowers few, lax. Calyx deeply 2-cleft. Standard suborbicular; wings obovate. Stamens 10, usually in 2 bundles of 5. Ovary stalked, few-ovuled. Pod a loment of 1-seeded joints, linear-oblong, compressed, indented on one or both the sutures; seeds estrophiolate.

1 Stem spongy. Calyx hispid.....*A. aspera*
1 Stem not spongy. Calyx glabrous.....*A. indica*

Aeschynomene aspera L., Sp. Pl. 713. 1753; Wight, Ic. t. 299. 1840; Gamble, Fl. Madras 331(234). 1918. Rudd, Reinwardtia 5: 29. 1959.

Shrub to 3 m. Leaves 12 cm long; stipules setaceous; leaflets to 1.5× 0.2 cm. Raceme hispid. Flowers 2 cm long. Corolla yellow. Pod to 7×0.8 cm; joints 5-7, echinate.

Paleotropics. Frequent in tanks and streams. All seasons. Stem used for making sun hats, fishing floats, toys etc. *CJS* 12315, 15024.

Aeschynomene indica L., Sp. Pl. 713. 1753; Wight, Ic. t. 405. 1840; Gamble, Fl. Madras 331(234). 1918; Rudd, Reinwardtia 5: 30. 1959.

Glabrescent herbs. Leaves sensitive, to 10 cm long; stipules not setaceous; leaflets to 0.6×0.2 cm. Raceme viscid. Flowers 1-few, 1.5 cm long. Corolla yellowish-pink. Pod to 4×0.4 cm long, entire on one margin; joints 8-12, papillose.

Pantropics. Frequent in moist places, in plains. August-December. *CJS* 15356, *HFP* 2273.

Note: According to Dr. Velva Rudd (*l. c.*) *A. indica* is apparently native to America and was introduced to the Old World. The type, however, comes from 'India'.

ALYSICARPUS Desvaux *nom. cons.*

Herbs. Leaves usually 1-foliolate; stipules scarious. Racemes with flowers usually in pairs. Calyx deeply lobed; upper 2 lobes connate. Keel petals each with short central appendage on its back. Stamens 9+1. Ovary sessile, many-ovuled. Pod a loment of 1-seeded joints.

1 Calyx less than 0.5 cm long, equaling or slightly longer than 1st joint of pod.....
.....*A. monilifer*
1 Calyx about 1 cm long, much longer than 1st joint of pod.
2 Pedicels 0.2 cm long. Corolla white. Joints of pod not ribbed.....*A. bupleurifolius*
2 Pedicels 0.4 cm long. Corolla purplish-red. Joints of pod transversely ribbed.....
.....*A. rugosus*

Alysicarpus bupleurifolius (L.) DC., Prodr. 2: 352. 1825; Gamble, Fl. Madras 338(239). 1918. *Hedysarum bupleurifolium* L., Sp. Pl. 745. 1753; Roxb., Pl. Cor. t. 194. 1805.

Upper leaves linear-oblong, acute, to 4×0.5 cm, basal ones elliptic-suborbicular, to 1.5×0.7 cm. Calyx to 0.8 cm long; lobes ciliate or not, imbricate in fruit. Pod 1 cm long, slightly moniliform; joints 4-6, glabrous.

Indomalaysia, China. Frequent in plains and upper Ghats on wet ground among grasses. July-December. *CJS* 14268, *HFP* 1031.

Alysicarpus monilifer (L.) DC., Prodr. 2: 353. 1825; Gamble, Fl. Madras 338(238). 1918. *Hedysarum moniliferum* L., Mant. 102. 1767.

Leaflets elliptic, obtuse, 1.5×1 cm, sometimes oblong and acute, 2×1 cm towards apex. Calyx to 0.3 cm long; lobes ciliate, valvate in fruit. Corolla pink. Pod moniliform, 1 cm long; joints 4-5, subglobose, with hooked hairs.

India, Burma, Central E. Africa. Collected once in flower and fruit in Arsikere on October 8, 1969. *CJS* 15170.

Note: *CJS* 11380 and *HFP* 1083 have joints of pods distinctly reticulate, otherwise they resemble *A. monilifer.*

Alysicarpus rugosus (Willd.) DC., Prodr. 2: 353. 1825; Gamble, Fl. Madras 338(239). 1918; Verdcourt, Kew Bull. 24: 67. 1970. *Hedysarum violaceum* Forsk., Fl. Aegyp-Arab. 136. 1775, non L., 1753. *Hedysarum rugosum* Willd., Sp. Pl. 3: 1172. 1802.

Leaves often 3-foliolate; leaflets oblong, to 2×1 cm. Calyx to 1 cm long; lobes ciliate, imbricate in fruit. Pod moniliform, included; joints 3-5.

Paleotropics. Occasional in western plains and upper Ghats. October-November. *CJS* 15374, *HFP* 1021.

Note: Santapau (*Fl. Khandala* ed. 3, 60. 1967) reduces *Hedysarum violaceum* Forsk., non L. and *Alysicarpus rugosus* to *Alysicarpus glumaceus* (Vahl) DC., whereas Verdcourt (*l. c.*) keeps them separate while discussing probable natural hybrid populations in Africa.

ATYLOSIA Wight & Arnott

Leaves 3-foliolate; leaflets usually triplinerved, with resinous dots beneath. Calyx lobes 5, upper 2 connate, lowest the longest. Petals often persistent; standard auricled, spurred. Stamens 9+1. Ovary sessile, few-ovuled. Pod linear or oblong, flat, septate, dehiscent; seeds strophiolate.

1 Plants climbing. Leaflets nearly as long as broad. Flowers in racemes..... ..... *A. albicans*

1 Plants erect. Leaflets more than twice as long as broad. Flowers in pairs..... ..... *A. lineata*

Atylosia albicans (Wight & Arn.) Bentham in Miq., Pl. Jungh. 243. 1852; Gamble, Fl. Madras 369(260). 1918. *Cantharospermum albicans* Wight & Arn., Prodr. 256. 1834, in part.

Grey-canescent climbing shrubs. Leaflets obtuse, to 3×2.7 cm, densely pubescent beneath, chartaceous. Raceme slender, 3-5 cm long, few-flowered. Calyx teeth shorter than tube. Corolla yellow, 2 cm long. Pod white-pubescent, 4×1 cm, 5-7 seeded.

South W. India, Sri Lanka. Occasional in scrub. September-November. *CJS* 15189, *HFP* 1080.

Atylosia lineata Wight & Arn., Prodr. 258. 1834; Gamble, Fl. Madras 368(260). 1918. *Atylosia lawii* Wight, Ic. t. 93. 1838.

Softly hirsute, erect undershrubs. Leaflets subacute, to 4×1.5 cm, membranous, pubescent beneath. Flower-pairs on minute peduncle, 1.4 cm long. Calyx teeth equaling the tube. Corolla yellow, marcescent. Pod grey-silky-pubescent, 2×0.6 cm, 2-3-seeded.

South W. India. Frequent in wet deciduous forests. All seasons. *CJS* 12269, *HFP* 2774.

BUTEA Roxburgh ex Willdenow *nom. cons.*

Leaves pinnately 3-foliolate, long-petioled. Calyx broadly campanulate, shortly lobed; upper 2 lobes connate into lip. Standard ovate, equaling keel. Stamens 9+1. Ovary sessile, 2-ovuled. Pod falcate-oblong, compressed, woody, tomentose, 1-seeded and dehiscent at apex.

Butea monosperma (Lam.) Taub. in Engl. & Prantl, Pflanzenfam. 3(3): 366. 1894; Sant., Fl. Khandala ed. 3, 66. 1967. *Erythrina monosperma* Lam., Encycl. 1: 391. 1785. *Butea frondosa* Koenig ex Roxb., Asiat. Res. 3: 369. 1792; Gamble, Fl. Madras 357(252). 1918. *Plaso monosperma* (Lam.) Kuntze, Rev. Gen. Pl. 1: 202. 1891.

Deciduous, tomentose trees to 8 m. Leaf rachis 15-20 cm; leaflets rhomboid or broadly ovate, retuse, rounded at base, to 16×18 cm, with

the nerves raised beneath. Raceme 8-12 cm long. Flowers showy, flame-colored, 6 cm long. Lowest calyx tooth shortest. Pod 17×6 cm, distinctly stalked, rounded at base.

Indomalaysia. Frequent in dry plains. January-May. *CJS* 13227, *HFP* 1341. The leaves are stitched into plates in restaurants. A leafless and showy tree in flower. (Plate 5).

CAJANUS A. P. de Candolle *nom. cons.*

Shrubs. Leaves pinnately trifoliolate; leaflets with indistinct resinous dots beneath. Upper 2 calyx lobes connate, lower 3 subequal. Standard with 2 callosities above the claw. Stamens 9+1. Ovary subsessile, few-ovuled. Pod oblong, turgid, obliquely depressed between seeds.

Cajanus cajan (L.) Millspaugh, Publ. Field Columbian Mus., Bot. 2: 53. 1900. *Cytisus cajan* L., Sp. Pl. 739. 1753. *Cajanus indicus* Spreng., Syst. 3: 248. 1826; Gamble, Fl. Madras 369(261). 1918. *Cajan cajan* (L.), Huth, Helios 11: 133. 1893.

Branches pubescent. Leaf rachis 1-2 cm; leaflets elliptic-oblong, to 3×1.5 cm, silky beneath, chartaceous. Raceme 6-10 cm long. Corolla yellow. Pods pubescent and glandular, to 5×1 cm.

Tropics. Occasionally found wild in dry deciduous plains. December-February. *CJS* 12383, 15949. Cultivated for the seeds.

CLITORIA Linnaeus

Leaves odd-pinnate; stipules persistent, striate. Bracts at the tip of the peduncle smaller than round bracteoles situated at tip of the pedicel. Flowers resupinate. Calyx with upper 2 lobes connate. Corolla wings adherent to keel. Stamens 9+1 but sometimes monadelphous. Ovary stalked, many-ovuled; style bearded. Pod compressed, entire, oblong, tipped with persistent base of style, dehiscent.

Clitoria ternatea L., Sp. Pl. 753. 1753; Gamble, Fl. Madras 365(258). 1918.

Glabrescent, slender twiners. Leaf rachis 6 cm long; leaflets 5-7, elliptic, obtuse or retuse, rounded at base, to 3.5×2.5 cm. Flowers upside down, solitary. Corolla bluish-white, 4 cm long. Stamens usually diadelphous. Pod 8×1 cm, pubescent.

Tropics. Frequent in upper Ghats, and plains. October-January. *CJS* 15557, *HFP* 2363. Often cultivated ornamental.

CROTALARIA Linnaeus

Herbs or shrubs. Leaves usually 1-foliolate. Calyx lobes usually

free. Corolla generally yellow. Standard often callose above the short claw; wings with rows of transverse folds; keel beaked. Stamens monadelphous; staminal sheath cleft above; alternate anthers long, basifixed with flat filaments and short ones versatile with slender filaments. Ovary sessile, 2-many-ovuled; style pubescent toward apex. Pod turgid, oblong, dehiscent, sessile or stalked; seeds estrophiolate.

1 Leaves long-petiolate, digitately 3-5-foliolate.
2 Leaves 3-foliolate; bracts minute, erect; pod cylindrical.....*C. pallida*
2 Leaves for the greater part 5-foliolate; bracts lanceolate, reflexed; pod compressed .....*C. quinquefolia*
1 Leaves subsessile, 1-foliolate.
3 Inflorescence a terminal umbel, often with axillary flowers below it.....*C. umbellata*
3 Inflorescence a raceme or flowers solitary.
4 Stipules semilunate, deflexed.
5 Stipules conspicuous. Wings yellow.....*C. walkeri*
5 Stipules minute. Wings blue.....*C. heyneana*
4 Stipules subulate, erect or 0.
6 Leaves ovate-suborbicular, not more than $1\frac{1}{2}$ as long as broad.
7 Flowers solitary; calyx over 1 cm long.....*C. bifaria*
7 Flowers 2-6 per peduncle; calyx to 0.5 cm long.
8 Pod glabrous; peduncle filiform, over 2 cm long.....*C. humifusa*
8 Pod hairy; peduncle thick, less than 2 cm long.....*C. angulata*
6 Leaves elliptic or lanceolate, more than twice longer than broad.
9 Plants viscid with foetid odor; bracts and stipules many, linear, recurved, persistent.....*C. paniculata*
9 Plants otherwise.
10 Flowers small; petals less than 1.5 cm.
11 Plants prostrate, spreading or straggling.
12 Pod hairy; calyx less than 1 cm long.....*C. pusilla*
12 Pod glabrous; calyx more than 1 cm long.....*C. hirta*
11 Plants erect.
13 Pod hairy; leaves elliptic-lanceolate, scarcely pubescent beneath.....*C. triquetra*
13 Pod glabrous; leaves oblanceolate, densely pubescent beneath.....*C. albida*
10 Flowers large; petals 2-3 cm long.
14 Leaves glabrous above.
15 Pods velvety.....*C. heyneana*
15 Pods glabrous.
16 Calyx villous, including pod; leaves acute.....*C. calycina*
16 Calyx minutely pubescent; pod exserted; leaves rounded to retuse.....*C. retusa*
14 Leaves pubescent above.
17 Flowers 1-3. Pod glabrous.....*C. salicifolia*
17 Flowers 5 or more. Pod pubescent.
18 Leaves slightly retuse, not mucronate, not silky.....*C. obtecta*
18 Leaves mucronate, silky.
19 Leaves elongate-elliptic, to 1.5 cm broad; bracts inconspicuous, to 0.3 cm long, yellowish when dry.....*C. juncea*
19 Leaves obovate, over 3 cm wide; bracts conspicuous, over 1 cm long, black when dry.....*C. berteroana*

Crotalaria albida Heyne ex Roth, Nov. Pl. Sp. 333. 1821; Gamble, Fl. Madras 295(208). 1918.

Profusely branched herbs with appressed silky pubescence. Leaves obovate, obtuse or emarginate, cuneate, to 2×0.3 cm, glabrous above, pellucid-punctate. Raceme terminal, few-many-flowered. Calyx 1.2 cm long. Corolla equaling the calyx, glabrous. Pod glabrous, 2-5-seeded.

Indomalaysia, China. Occasional on dry, stony soil, across the plains. January-September. *CJS* 10850-A, 12336.

Crotalaria angulata Miller, Gard. Dict. ed. 8, 9. 1768. *Astragalus biflorus* L., Mant. Alt. 273. 1771. *Crotalaria biflora* (L.) L., Mant. Alt. 570. 1771; Gamble, Fl. Madras 292(206). 1918.

Diffuse, silky herbs with a stout rootstock. Leaves to 1.5×1 cm, membranous. Raceme lateral, closely 2-flowered, rarely flowers solitary. Calyx to 0.5 cm long. Corolla slightly exserted, yellow, glabrous. Pod suborbicular, hairy, 15-20 seeded.

Indomalaysia. Occasional on dry, stony soil in plains. March-September. *CJS* 10668, *HFP* 1516.

Note: According to Drs. Rudd and Polhill, *C. angulata* pertains to this species and is priorable.

Crotalaria berteroana DC., Prodr. 2: 127. 1825 ('*berteriana*'). *Crotalaria fulva* Roxb., Fl. Indica 3: 266. 1832; Gamble, Fl. Madras 298(211). 1918.

Silky undershrubs. Leaves sessile, obovate, to 8×5 cm. Flowers in panicles; bracts conspicuous. Calyx to 2 cm long. Corolla exserted, yellow; standard with shiny hairs outside. Pod 2-seeded.

Paleotropics, naturalized in Neotropics. Locally common at Nagpuri (hills in the plains). November-February. *CJS* 15540, 16074.

Crotalaria bifaria L. f., Suppl. 322. 1781; Wight, Ic. t. 30. 1838; Gamble, Fl. Madras 293(207). 1918.

Trailing, sparsely pubescent herbs. Leaves to 1×0.7 cm, membranous. Flowers terminal. Calyx to 1.2 cm long. Corolla slightly exceeding the calyx, blue, often standard yellow outside with purple striations. Pod oblong, glabrescent, 8-12-seeded.

South W. India, Sri Lanka. Locally common at Bourdalboore State Forest (scrub). September-December. *HFP* 1243, 2362.

Crotalaria calycina Schrank, Pl. Rar. Hort. Monac. t. 12. 1817; Gamble, Fl. Madras 295(209). 1918.

Brown-silky herbs. Leaves variable, obovate-lanceolate, subacute, to 4.5×1.5 cm, chartaceous. Flowers terminal in lax racemes or axillary. Calyx to 2 cm long. Corolla equaling calyx, yellow; standard villous

on the back. Pod glabrous, 20-seeded.

Paleotropics. Locally common at Shigegudda. August-November. *CJS* 9229, 11368.

Crotalaria heyneana Graham ex Wight & Arn., Prod. 187. 1834; Gamble, Fl. Madras 297(210). 1918.

Sparsely pubescent undershrubs. Stipules minute, caducous. Leaves elliptic-ovate, cuneate, to 10×4 cm, membranous. Raceme many-flowered. Calyx to 1.5 cm long. Corolla just exserted; standard pale yellow or white, with scattered hairs on the back; wings blue. Pod hairy, 10-seeded.

South W. India. Frequent in lower Ghats. October-December. *CJS* 11398, *HFP* 2337.

Crotalaria hirta Willd., Ges. Naturf. Freude Berlin Neue Schriften 4: 217. 1803; Gamble, Fl. Madras 295(208). 1918.

Decumbent, villous herbs. Leaves oblong, obtuse, to 3 × 0.5 cm, glabrous above. Raceme terminal, closely 2-few-flowered or flowers solitary. Calyx to 1.2 cm long. Corolla equaling calyx, yellow, glabrous. Pod to 1.5 cm, 15-20-seeded.

S. India. Collected once in flower and fruit along Konnanur Road on October 27, 1969. *CJS* 15383.

Crotalaria humifusa Graham ex Bentham, London J. Bot. 2: 476. 1843; Gamble, Fl. Madras 292(206). 1918.

Trailing, slender herbs with short, spreading hairs. Leaves to 2.2×2 cm, membranous. Raceme lateral. Calyx to 0.4 cm long. Corolla equaling calyx, yellow, glabrous. Pod to 0.6 cm, 6-10-seeded.

Indomalaysia. Collected once in flower at Panorama Point, Shiradi Ghat on October 25, 1970. *HFP* 1014.

Crotalaria juncea L., Sp. Pl. 714. 1753; Roxb., Pl. Cor. t. 193. 1805; Gamble, Fl. Madras 297(210). 1918.

Erect, stiff, shining, brown-silky undershrubs; stem and branches furrowed. Leaves to 7×1.5 cm. Raceme terminal, many-flowered. Calyx to 1.5 cm long. Corolla exserted, yellow; standard pubescent beneath. Pod velvety, 10-15-seeded.

Indomalaysia. Collected once in flower at Harihalli on October 9, 1964. *CJS* 9190.

Crotalaria obtecta Graham ex Wight & Arn., Prodr. 185. 1834.

var. **glabrescens** (Bentham) Baker in J. Hooker, Fl. Brit. India 2: 79. 1876; Gamble, Fl. Madras 297(210). 1918. *Crotalaria glabrescens* Bentham, London J. Bot. 3: 563. 1844.

Sparsely pubescent shrubs with stem and branches furrowed. Leaves elliptic, to 7×3.5 cm, chartaceous. Raceme terminal, many-flowered.

Calyx to 2.5 cm long. Corolla yellow; standard hairy beneath. Pod velvety, oblong, 10-12-seeded.

South W. India. Collected once in flower near edge of a shola at Genkalbetta (upper Ghats) on December 4, 1970. *HFP* 1182.

Crotalaria pallida Aiton, Hort. Kew 3: 20. 1789; Adams, Fl. Pl. Jamaica 345. 1972. *Crotalaria mucronata* Desv., J. Bot. 3: 76. 1814; Backer & Bakh. f., Fl. Java 1: 584. 1963. *Crotalaria striata* DC., Prodr. 2: 131. 1825; Gamble, Fl. Madras 301(212). 1918.

Glabrescent undershrubs. Leaflets petiolate, elliptic, acute-mucronate, to 10 × 4.5 cm, minutely pubescent beneath, membranous. Raceme many-flowered. Calyx to 1 cm long. Corolla exserted, yellow, glabrous. Pod glabrous, 15-25-seeded.

Tropics. Common in plains and Ghats. September-April. *CJS* 12087, 15564.

Crotalaria paniculata Willd., Sp. Pl. 3: 982. 1802; Gamble, Fl. Madras 299(211). 1918.

Sticky, foetid undershrubs with silky hairs. Stipules linear; leaf-blade oblong, obtuse to 1.5×0.5 cm, membranous. Racemes in short panicle, terminal, many-flowered. Bracts- linear. Calyx 1 cm long. Corolla equaling calyx, yellow; standard hairy beneath. Pod scarcely exserted, finely silky, 1-2-seeded.

Indomalaysia. Collected once at Holenarsipur in the plains on October 27, 1969. *CJS* 15359.

Crotalaria pusilla Heyne ex Roth, Nov. Pl. Sp. 335. 1821; Gamble, Fl. Madras 296(209). 1918.

Diffuse, pubescent herbs. Leaves linear-lanceolate, 1-1.5×0.2-0.4 cm, membranous. Raceme terminal, few-many-flowered. Calyx to 0.4 cm long. Corolla just exserted, glabrous. Pod to 0.8 cm, villous, 4-6-seeded.

South W. India. Frequent on dry, stony soil across the plains. June-November. *CJS* 11352, *HFP* 2219.

Crotalaria quinquefolia L., Sp. Pl. 716. 1753; Gamble, Fl. Madras 301(213). 1918.

Large herbs, with minute appressed pubescence. Stipules subulate, reflexed. Leaves digitately 3-5-foliolate; petiole to 6 cm, leaflets oblong-lanceolate, to 9×2 cm, glabrous above. Raceme terminal, lax; bracts lanceolate, reflexed. Calyx 1 cm long. Corolla yellow, with purple striations, glabrous. Pod glabrous, 20-40-seeded.

Indomalaysia. Collected once in flower at Shantigrama on October 6, 1973. *HFP* 2900.

Crotalaria retusa L., Sp. Pl. 715. 1753; Gamble, Fl. Madras 293(207). 1918.

Erect, robust undershrubs; branches furrowed, white-pubescent. Leaves obovate, cuneate, to 10×2.8 cm, chartaceous. Raceme many-flowered. Calyx to 1.2 cm long. Corolla yellow, glabrous. Pod to 4×1.2 cm, many-seeded.

Tropics. Frequent in upper Ghats and western plains. All seasons. *HFP* 974, 1339.

Crotalaria salicifolia Heyne ex Wight & Arn., Prodr. 182. 1834; Gamble, Fl. Madras 294(208). 1918.

Large herbs, appressed with silky hairs. Leaves elliptic-lanceolate, obtuse, to 9×3 cm, membranous. Calyx to 1.7 cm long. Corolla yellow, glabrous. Pod oblong, 20 or more-seeded.

South W. India. Rare, collected once in flower and fruit at Shiradi Ghat on November 25, 1971. *HFP* 2543.

Crotalaria triquetra Dalzell, Hooker's J. Bot. Kew Gard. Misc. 2: 34. 1850; Gamble, Fl. Madras 296(209). 1918.

Suffruticose herbs with slender 3-4-angled branches. Leaves oblong, obtuse, to 2×0.5 cm, glabrous above, membranous. Racemes 1-few-flowered. Calyx to 1 cm long. Corolla exserted, glabrous. Pod oblong, to 2.5×0.4 cm, 15-20-seeded.

South W. India, Sri Lanka. Occasional in upper Ghats. December-February. *CJS* 15860, *HFP* 2634.

Crotalaria umbellata Wight ex Wight & Arn., Prodr. 191. 1834; Gamble, Fl. Madras 294(208). 1918.

Erect, dark brown-villous herbs. Leaves oblong, obtuse, to 3.2×0.7 cm, membranous, sparsely hairy above, densely beneath. Umbel 8-12-flowered. Calyx to 0.5 cm long; upper 2 lobes nearly connate. Corolla equaling calyx, glabrous. Pod equaling or included in the calyx, globose, glabrous, few-seeded.

South W. India, Sri Lanka. Occasional in upper Shiradi Ghat. September-November. *HFP* 1045, 2489.

Note: Santapau synonymizes *Crotalaria umbellata* under *C. nana* N. Burman.

Crotalaria walkeri Arn., Nov. Actorum Acad. Caes. Leop. Carol. Nat. Cur. 18 (1): 328. 1840; Gamble, Fl. Madras 297(210). 1918. *Crotalaria semperflorens* var. *walkeri* (Arn.) Baker in J. Hooker, Fl. Brit. India 2: 78. 1876.

Glabrescent undershrubs. Leaves subsessile, simple; stipules semilunate. Racemes many-flowered. Calyx to 1 cm long. Corolla exserted, glabrous. Pod pubescent, 10-15-seeded.

South W. India. Frequent in middle or upper Ghats. June-November. *HFP* 186, 2159.

DALBERGIA Linnaeus filius *nom. cons.*

Trees or shrubs, sometimes climbing. Leaves odd-pinnate; leaflets alternate, usually 5 or more. Inflorescence a panicle or cyme. Flowers each subtended by 2 minute bracteoles. Calyx lobes 5, shorter than tube, connate, upper 2 the largest. Stamens 9 or 10; staminal tube cleft above. Ovary stalked, 1-few-ovuled. Pod indehiscent, thin, samaroid; seeds 1-4.

1 Style short, thick; standard flat, erect; wings and keel petals not or shortly spurred (stamens 9-10, monadelphous).....*D. sympathetica*
1 Style elongate, slender; standard reflexed; wings and keel petals spurred.
2 Standard long-clawed, with spur; leaflets 20 or more; stamens 10, monadelphous. .....*D. acaciifolia*
2 Standard cuneate, not spurred; leaflets 15 or less.
3 Stamens 9, monadelphous.
4 Leaflets obtuse or emarginate; inflorescence of fascicled, corymbose panicles; trees of deciduous areas.....*D. latifolia*
4 Leaflets acute; inflorescence of solitary, elongate panicles; trees of wet areas..... .....*D. sissoides*
3 Stamens 10, isodiadelphous (5+5).
5 Standard longer than broad.....*D. paniculata*
5 Standard as long as broad.
6 Tree; flowers in loose panicles.....*D. lanceolaria*
6 Shrubby climber; flowers in dense panicles.....*D. volubilis*

Dalbergia acaciifolia Dalzell, Hooker's J. Bot. Kew Gard. Misc. 2: 37. 1850; Prain, Ann. Roy. Bot. Gard. (Calcutta) 10(1): 68, t. 47. 1905; Gamble, Fl. Madras 382(269). 1918 ('*acaciaefolia*').

Climbing shrubs with twisting branches. Leaves 8-10 cm long; leaflets oblong, emarginate, obliquely truncate at base, to 2×0.6 cm, chartaceous, shining above. Corolla pink, petals all clawed at base. Stamens 10, monadelphous. Pod 4-8×1.5 cm.

South W. India. Occasional in Bisle Ghat. March-May. *HFP* 1471, 2868.

Dalbergia lanceolaria L. f., Suppl. 316. 1781; Gamble, Fl. Madras 383(270). 1918. *Dalbergia frondosa* Roxb., [Hort. Beng. 53. 1814, *nom.*] Fl. Ind. 3: 226. 1832; Wight, Ic. t. 266. 1840; Prain, Ann. Roy. Bot. Gard. (Calcutta) 10(1); 93, t. 76. 1905.

Deciduous tree to 20-25 m with pubescence on young parts. Leaves 15-20 cm long; leaflets 13-15, obovate, emarginate, 3×1.5 cm, membranous. Corolla white; petals except standard, clawed at base. Stamens 5+5. Pod narrowed at both ends, 4-10×1.5 cm.

India, Sri Lanka. Collected once in flower and young pod at Byra (dry deciduous forest on plain) on May 27, 1970. *CJS* 16702.

Dalbergia latifolia Roxb., Pl. Cor. t. 113. 1799; Prain, Ann. Roy. Bot.

Gard. (Calcutta) 10(1): 80, t. 62. 1905; Gamble, Fl. Madras 383(270). 1918.

Deciduous trees to 8 m. Leaves 20-25 cm; leaflets 7-9, elliptic-orbicular, rounded or emarginate, cuneate at base, 5×4 cm, glabrous, subcoriaceous. Corolla creamy white; petals except standard clawed at base. Stamens 9. Pod slightly thickened, glabrous, narrowed at both ends, 4-8×1.5 cm.

Indomalaysia. Collected once in flower along Hassan-Saklespur road on September 23, 1971. A valuable timber tree. *HFP* 2127.

Dalbergia paniculata Roxb., Pl. Cor. t. 114. 1799; Prain, Ann. Roy. Bot. Gard. (Calcutta) 10(1): 87, t. 68. 1905; Gamble, Fl. Madras 383(270). 1918.

Deciduous trees to 10-15 m. Leaves 15 cm long; leaflets 13-15, oblong or obovate, rounded or emarginate, 3.5×2 cm. Corolla brown, except standard; other petals clawed. Stamens 5+5. Pod glabrous, 7×1 cm.

South W. India. Locally common at Belvathalli and Nagpuri (dry deciduous plains). April-September. *CJS* 13533, 14369.

Dalbergia sissoides Graham ex Wight & Arn., Prodr. 265. 1834; Prain, Ann. Roy. Bot. Gard. (Calcutta) 10(1): 81, t. 63. 1905; Gamble, Fl. Madras 383(270). 1918. *Dalbergia latifolia* auct. non Roxb: Wight, Ic. t. 1156. 1846; Bedd., Fl. Sylv. t. 24. 1869.

Deciduous tree to 10 m. Leaves 20 cm long; leaflets 7-9, elliptic-ovate, obovate, acute, to 6×2.5 cm, shining above, chartaceous. Corolla white; wings and keel petals clawed at base. Stamens 9. Pod acute at apex, glabrous, to 9×1.5 cm.

South W. India. Frequent in upper Ghats. March-August. A valuable timber tree. *CJS* 13469, *HFP* 1457.

Note: The illustrations of Wight (*l. c.*) are given as synonyms under *Dalbergia latifolia* Roxb. by Santapau (*Fl. Khandala* ed. 3, 74. 1967) but under *Dalbergia sissoides* by Gamble (*l. c.*). Indeed, the illustrations combine characters of the two taxa which may prove to be ecological variants.

Dalbergia sympathetica Nimmo in Graham, Cat. Pl. Bombay 55. 1839; Sant., Fl. Khandala ed. 3, 74. 1967. *Dalbergia multiflora* Heyne ex Prain, Ann. Roy. Bot. Gard. (Calcutta) 10(1): 43, t. 18. 1905; Gamble, Fl. Madras 381(269). 1918.

Large, climbing shrubs often furnished with spines on the trunk and twisted branches. Leaves 10 cm long; leaflets 11-15, oblong or obovate, emarginate, 2×1.2 cm, pubescent. Flowers 0.6 cm long. Corolla white with wings and keel petals clawed at base. Stamens 10, monadelphous. Pod pubescent, 5-7×2 cm, 1-2-seeded.

South W. India. Frequent in lower Shiradi Ghat. December-February. *CJS* 12611, 15856.

Dalbergia volubilis Roxb., Pl. Cor. t. 191. 1805; Prain, Ann. Roy. Bot. Gard. (Calcutta) 10(1): 100, t. 85. 1905; Gamble, Fl. Madras 384(270). 1918.

Large, shrubby climbers. Leaves 10 cm long; leaflets 7-11, oblong, obovate, obtuse, 3.5×2 cm; venation fairly distinct. Corolla purple, with wings and keel petals clawed at base. Stamens 5+5. Pod obtuse, short-stalked, glabrous, 4-10×1.5 cm.

India, Burma, Sri Lanka. Frequent at Kempuhole (lower Shiradi Ghat). January-March. *CJS* 12616, *HFP* 1358.

DERRIS Loureiro *nom. cons.*

Usually climbing shrubs or trees. Leaves odd-pinnate. Flowers 1-few-fascicled on the rachis of racemes or panicles. Calyx cupular, truncate. Wings often spurred. Stamens usually monadelphous. Ovary subsessile, few-ovuled. Pod compressed, entire or winged on one or both the sides, indehiscent.

1 Trees; pod not winged; inflorescence racemose.....*D. indica*
1 Climbers; pod winged; inflorescence paniculate.
2 Stamens diadelphous. Pod distinctly winged on both the sutures.....*D. thyrsiflora*
2 Stamens monadelphous. Pod distinctly winged on one suture and very narrowly on the other suture.
3 Standard with callosities. Pod thick, velvety.....*D. benthamii*
3 Standard without callosities. Pod thin, pubescent.....*D. canarensis*

Derris benthamii (Thwaites) Thwaites, Enum. 413. 1864; Gamble, Fl. Madras 387(273). 1918; Thoth., Bull. Bot. Surv. India 3: 186. 1962. *Brachypterum benthamii* Thwaites, *l.c.* 93. 1859.

Leaflets in 2-4 pairs, elliptic-oblong, acuminate, rounded at base, to 8×4.5 cm. Panicle 10-20 cm, nodes few-flowered. Corolla white; standard without callus. Stamens monadelphous, 5 long and 5 short. Pod elliptic or round, dark brown-tomentose, turgid against seeds, to 6×2.5 cm, indistinctly veined, 1-2-seeded.

South India, Sri Lanka. Frequent across Ghats. January-July. *CJS* 11687, *HFP* 2776.

Derris canarensis (Dalzell) Baker in J. Hooker, Fl. Brit. India 2: 246. 1878; Gamble, Fl. Madras 387(273). 1918; Thoth., Bull. Bot. Surv. India 3: 190. 1962. *Pongamia canarensis* Dalzell, Hooker's J. Bot. Kew Gard. Misc. 2: 37. 1850.

Leaflets in 6-8 pairs, oblong, obtuse at both the ends, to 6.5×2 cm. Raceme 10 cm, nodes 3-flowered. Corolla white; standard with callus above the claw. Stamens monadelphous. Pod obliquely elliptic, apiculate, cuneate, flat, reticulate, glabrescent, 6×2 cm, 1-3-seeded.

South W. India. Occasional in upper Ghats. March-May. *CJS* 13489, *HFP* 1569.

Derris indica (Lam.) Bennett, J. Bombay Nat. Hist. Soc. 68: 303. 1971. *Cytisus pinnatus* L., Sp. Pl. 741. 1753 [non *Derris pinnata* Lour.]. *Robinia mitis* L., Sp. Pl. ed. 2, 1044. 1763, *nom. illegit. Galedupa indica* Lam., Encycl. 2: 594. 1788. *Pongamia glabra* Vent., Jard. Mal. t. 28. 1803; Wight, Ic. t. 59. 1838; Bedd., Fl. Sylv. t. 177. 1872; Gamble, Fl. Madras 385(272). 1918, *nom. illegit. Pongamia pinnata* (L.) Pierre, Fl. For. Cochinch. t. 385. 1899; Thoth., Bull. Bot. Surv. India 3: 418. 1962.

Evergreen trees. Leaflets 5-9, elliptic, acuminate, to 9×5 cm. Raceme to 15 cm long. Corolla pinkish-white; standard auricled. Stamens monadelphous; upper stamen free at base, connate from middle to closed tube. Pod woody, entire, obliquely oblong, beaked, to 4×2 cm, 1-seeded.

Paleotropics. Frequent across the District. Flowers March-April. Fruits to December. *CJS* 16715, *HFP* 2080.

Derris thyrsiflora (Bentham) Bentham, J. Linn. Soc. Bot. 4 (Suppl.): 114. 1860. *Milletia thyrsiflora* Bentham in Miq., Pl. Jungh. 249. 1852.

var. **eualata** (Bedd.) Thoth., Bull. Bot. Surv. India 3: 195. 1962. *Derris eualata* Bedd., Ic. t. 186. 1874; Gamble, Fl. Madras 388(274). 1918.

Leaflets in 3-5 pairs; broadly oblong, acuminate, rounded at base, 12×6 cm. Raceme a thyrsoid panicle, 25-35 cm long, nodes 1-flowered. Corolla white; standard with callus above the claw. Stamens 9+1. Pod oblong, glabrous, reticulate, 10×2.5 cm, 1-3-seeded.

South W. India. Frequent in lower Ghats. December-January. *CJS* 15816, 16006.

DESMODIUM Desvaux *nom. cons.*

Herbs or shrubs. Leaves usually 3-foliolate; stipules scarious; leaflets stipellate. Upper 2 calyx lobes connate. Wings subadherent to keel. Stamens usually 9+1. Ovary sessile or stalked, 2-many-ovuled. Pod a lomentum with several flat joints.

1 Leaves 1-foliolate. Petiole broadly winged; stamens monadelphous.....*D. triquetrum*
1 Leaves pinnately 3-foliolate. Petiole not winged.
2 Flowers hidden in persistent, orbicular, bifarious bracts; stamens monadelphous .....*D. pulchellum*
2 Flowers not hidden; bracts not orbicular.
3 Flowers in short axillary umbels. Stamens monadelphous.....*D. triangulare*
3 Flowers in racemes and/or few-flowered fascicles. Stamens diadelphous.

4 Trailing herbs.
5 Stem sparsely hairy. Flowers in fascicles; pedicel less than 1 cm long.....*D. triflorum*
5 Stem densely hairy. Flowers in fascicles and short racemes; pedicel over 1 cm long.....*D. heterophyllum*
4 Erect herbs or shrubs.
6 Lateral leaflets much smaller than terminal one.
7 Pod distinctly jointed; pedicel exceeding 1 cm.....*D. concinnum*
7 Pod indistinctly jointed; pedicel much shorter.....*D. motorium*
6 Leaflets subequal.
8 Stipules foliaceous, subamplexicaul. Pod indented on both sutures.....*D. dichotomum*
8 Stipules linear, scarious. Pod straight on one suture.
9 Terminal leaflet more than 3 cm broad. Joints of pod indehiscent.....*D. laxiflorum*
9 Terminal leaflet less than 2 cm wide. Joints of pod dehiscent.....*D. heterocarpon*

Desmodium concinnum DC., Prodr. 2: 335. 1825; Baker in J. Hooker, Fl. Brit. India 2: 170. 1876.

Sparsely pubescent herbs. Leaf rachis to 1.5 cm long; lateral leaflets much smaller; terminal leaflet elliptic, to 4×1.8 cm. Raceme lax, to 10 cm, silky pubescent. Corolla pink. Pod linear, distinctly indented on one suture; joints 4-6.

India, Burma. Collected once in flower and young fruit at Yethinalla (upper Shiradi Ghat) on October 8, 1970. *HFP* 907.

Desmodium dichotomum (Willd.) DC., Prodr. 2: 336. Nov. 1825; Knaap-van Meeuwen, Reinwardtia 6: 248. 1962; Backer and Bakh. f., Fl. Java 1: 604. 1963. *Hedysarum dichotomum* Willd., Sp. Pl. 3: 1180. 1802. *Hedysarum diffusum* Willd., *ibid. Desmodium diffusum* (Willd.) DC., Ann. Sci. Nat. (Paris) ser. 1, 4: 100. Nov. 1825; Wight, Ic. t. 208. 1839; Gamble, Fl. Madras 346(244). 1918, non DC., Jan. 1825.

Straggling, pubescent herbs. Leaf rachis 6 cm long; leaflets subequal, elliptic-ovate to suborbicular, to 5×3.5 cm. Raceme 20-30 cm long; flowers 4-5 per bract. Corolla pink. Pod linear, moniliform; joints 6-8, reticulate, with hooked hairs.

Indomalaysia. Rare; collected once in a *Sorghum* field at Arsikere (plain) on December 19, 1968. Very distinct species with very small flowers and moniliform pods. *CJS* 11951.

Desmodium heterocarpon (L.) DC., Prodr. 2: 337. 1825; Backer and Bakh. f., Fl. Java 1: 607. 1963. *Hedysarum heterocarpon* L., Sp. Pl. 747. 1753. *Hedysarum polycarpum* Poiret in Lam., Encycl. 6: 413. 1805. *Desmodium polycarpum* (Poiret) DC., Prodr. 2: 334. 1825; Wight, Ic. t. 406. 1840; Gamble, Fl. Madras 346(244). 1918. *Desmodium patens* Wight, Ic. t. 407. 1840.

Subscandent herbs or undershrubs; branches pubescent upwards. Leaf rachis 2-3 cm long; end leaflet elliptic-ovate to obovate, truncate or emarginate, cuneate, to 4.5×2.5 cm, pubescent beneath; side leaflets smaller. Raceme 4-10 cm long; flowers 1-2 per bract. Corolla blue. Pod linear, more or less indented and pubescent on both the sutures, with 6-8 reticulate joints.

Paleotropics. Collected once in flower and young fruit along the road to Magge (plain) on October 29, 1969. *CJS* 15449.

Desmodium heterophyllum (Willd.) DC., Prodr. 2: 334. 1825; Gamble, Fl. Madras 347(245). 1918. *Hedysarum heterophyllum* Willd., Sp. Pl. 3: 1201. 1802. *Hedysarum caespitosum* Poiret in Lam., Encycl. 6: 421. 1805. *Desmodium caespitosum* (Poiret) DC., Prodr. 2: 333. 1825. *Desmodium triflorum* var. *major* Wight & Arn., Prodr. 229. 1834; Wight, Ic. t. 291. 1840.

Procumbent herbs. Leaf rachis 2-3 cm long; leaflets subsimilar or terminal one larger, elliptic-obovate, truncate, with appressed hairs beneath. Corolla pink. Pod oblong, indented on one suture, sparsely pubescent, with 2-4 joints.

Indomalaysia, China. Occasional in plains and upper Ghats. May-October. *CJS* 10012, 13517.

Desmodium laxiflorum DC., Ann. Sci. Nat. (Paris) ser. 1, 4: 100. Jan. 1825; Gamble, Fl. Madras 344(243). 1918; Knaap-van Meeuwen, Reinwardtia 6: 252. 1962. *Desmodium diffusum* DC., *l. c.*, non (Willd.) DC., Nov. 1825. *Hedysarum recurvatum* Roxb., Fl. Ind. 3: 358. 1832. *Hedysarum diffusum* Roxb., [Hort. Beng. 57. 1814, *nom.*] Fl. Ind. 3: 357. 1832, non Willd., 1802. *Desmodium recurvatum* (Roxb.) Graham ex Wight & Arn., Prodr. 226. 1834; Wight, Ic. t. 374. 1840.

Pubescent undershrubs; branches quadrangular. Leaf rachis 7 cm long; leaflets with silky hairs beneath, variable, end one larger, to 14×8 cm, membranous. Raceme 30-40 cm long; flowers 2-5 per bract. Standard white; other petals blue. Pod linear, sutures straight; joints 6-10, with sticky hooked hairs.

Indomalaysia. Frequent in Shiradi Ghat. September-November. *CJS* 11478, *HFP* 774.

Note: Candolle's Jan. 1825 *Desmodium diffusum* is based on Roxburgh's specimens. In view of the confusion surrounding this binomial, it is appropriate to follow Knaap-van Meeuwen's nomenclature.

Desmodium motorium (Houtt.) Merrill, J. Arnold Arbor. 19: 345. 1938; Backer & Bakh. f., Fl. Java 1: 605. 1963. *Hedysarum motorium* Houtt., Nat. Hist. 10: 246. 1779. *Hedysarum gyrans* L. f., Suppl. 332. 1781. *Desmodium gyrans* (L. f.) DC., Prodr. 2: 326. 1825; Wight,

Ic. t. 294. 1840; Gamble, Fl. Madras 348(245). 1918.

Erect herbs or undershrubs. Leaf rachis 2 cm long; end leaflet ovate-oblong, obtuse, truncate at base, to 7×1.5 cm, hairy beneath; side leaflets often moving in jerks. Raceme 10-15 cm long; flowers solitary in the axil of the bract. Corolla pink. Pod oblong, pubescent, indented on one suture only, with 8-10 indistinct septa (joints not separating).

Indomalaysia. Rare; collected once in flower and fruit at Kempuhole (lower Shiradi Ghat) on October 25, 1971. *HFP* 2367.

Desmodium pulchellum (L.) Bentham, Fl. Hongk. 83. 1861; Gamble, Fl. Madras 344(243). 1918. *Hedysarum pulchellum* L., Sp. Pl. 747. 1753.

Erect undershrubs. Leaf rachis 4 cm long; leaflets repand, elliptic-ovate, truncate at base, tomentose beneath, end one larger, 8×4 cm. Raceme 10-30 cm long; flowers 3-5 in each cluster, hidden by orbicular bracts. Corolla yellow. Pod glabrous, with 1-3 round, reticulate joints.

China, Indomalaysia. Rare, collected once in flower and fruit at Nagpuri (dry deciduous forest) on October 27, 1970. *HFP* 1077.

Note: The plant is very distinct with the bracts covering the flowers.

Desmodium triangulare (Retz.) Merrill, J. Arnold Arbor. 23: 170. 1942. *Hedysarum triangulare* Retz., Obs. Bot. 3: 40. 1783.

var. **congestum** (Wight & Arn.) Sant., Kew Bull. 276. 1948. *Desmodium congestum* Wall. ex Wight & Arn., Prod. 224. 1834; Wight, Ic. t. 209. 1839. *Desmodium cephalotes* var. *congestum* (Wight & Arn.) Prain, J. Asiat. Soc. Bengal 66: 389. 1898; Gamble, Fl. Madras 344(242). 1918.

Erect undershrubs with triquetrous stem. Leaf rachis 4 cm long; leaflets ovate-obovate, long-acuminate, cuneate, shining above, silky beneath, end one larger, 8.5×4 cm. Umbels subsessile, 20-more-flowered. Corolla creamy white. Pod oblong, more or less indented on both the sutures, with appressed pubescence and 4-5 joints.

Indomalaysia, China. Occasional across the Ghats. September-January. *CJS* 16008, *HFP* 913.

Desmodium triflorum (L.) DC., Prodr. 2: 334. 1825; Gamble, Fl. Madras 347(245). 1918. *Hedysarum triflorum* L., Sp. Pl. 749. 1753. *Desmodium triflorum* var. *minus* Wight & Arn., Prodr. 229. 1834; Wight, Ic. t. 292. 1840.

Wiry, spreading herbs, rooting at basal nodes. Leaf rachis to 1 cm long; leaflets subequal, obovate, truncate-emarginate at apex, cuneate, to 0.6×0.5 cm, white-hairy on the nerves beneath. Standard purplish, other petals blue. Pod linear, more or less indented on both the sutures, with 3-5 joints.

Tropics. Common in plains and Ghats, usually in the open. October-November. *CJS* 15404, *HFP* 1037.

Desmodium triquetrum (L.) DC., Prodr. 2: 326. 1825; Gamble, Fl. Madras 345(244). 1918. *Hedysarum triquetrum* L., Sp. Pl. 746. 1753.

Undershrubs with triangular stem. Petiole wing foliaceous, to 2× 0.4 cm; leaf blade ovate-lanceolate, acuminate, truncate at base, to 12×3.5 cm. Raceme 10-20 cm long; flowers 1-5 per bract. Corolla bluish-purple. Pod oblong, with appressed pubescence, 6-8 square joints, occasionally indented on one suture.

Indomalaysia, China. Occasional in upper Ghats and at Byra (plains). September-January. *CJS* 11423, *HFP* 2328.

DOLICHOS Linnaeus

Leaves pinnately trifoliolate; stipules and stipels subulate, scarious. Calyx bilabiate. Standard auricled; wings subadherent to keel; keel slightly curved. Stamens 9+1. Ovary subsessile, few-ovuled; style curved, narrowed above, short, penicillate around the capitate stigma. Pod flat, continuous, dehiscent; seeds arillate or strophiolate.

Dolichos trilobus L., Sp. Pl. 726. 1753; Verdcourt, Taxon 17: 173. 1968. *Dolichos falcatus* Klein ex Willd., Sp. Pl. 3: 1047. 1802; Gamble, Fl. Madras 366(259). 1918; Meikle, Kew Bull. 5: 353. 1951.

Glabrescent, slender twiners. Leaf rachis 3 cm long; leaflets triangular-ovate, acute, cuneate, 3.5 × 2.2 cm. Raceme 1-10 cm long. Calyx lobes short. Corolla blue, 1.5 cm long. Pod 5-8×0.8 cm, many-seeded.

Paleotropics. Collected once in flower at Kithoor estate, near Gendehally, bordering Chickmagalur District on January 17, 1969. *CJS* 12362.

DUMASIA A. P. de Candolle

Leaves pinnately trifoliolate; stipules setaceous; stipels filiform, caducous. Raceme axillary, slender; bracts small. Flowers 1-2 per node. Calyx cylindrical, gibbous at base, obliquely truncate. Standard obovate, auricled; wings and keel petals very long-clawed. Stamens 9+1. Ovary subsessile, many-ovuled; style dilated above middle, beardless. Pod oblong, compressed, torulose, continuous, dehiscent, tomentose.

Dumasia villosa DC., Ann. Sci. Nat. (Paris) ser. 1, 4: 96. 1825; Gamble, Fl. Madras 351(247). 1918. *Dumasia congesta* Graham ex Wight & Arn., Prodr. 206. 1834; Wight, Ic. t. 445. 1841.

Slender climbing herbs with short spreading hairs. Leaf rachis 7 cm long; leaflets ovate, obtuse, truncate at base, to 8 × 5 cm. Raceme to 10 cm long with lax flowers. Calyx 1.3 cm long. Corolla yellow, 2.4 cm long. Pod 6 × 0.6 cm.

Paleotropics. Occasional in upper Bisle Ghat (Panorama Point). November-January. *CJS* 15892.

ERYTHRINA Linnaeus

Leaves pinnately trifoliolate; stipules small, caducous; stipels gland-like. Raceme nodes tumid. Calyx spathaceous, split on one or two sides, toothed or not at tip. Standard longer than wings and keel. Stamens 10, the vexillary stamen free or connate at base, others connate to middle, alternately long and short. Ovary stalked, few-many-ovuled. Pod linear, sinuate between seeds, partly or completely dehiscent.

1 Armed trees. Wings smaller than keel petals.....*E. stricta*
1 Unarmed trees. Wings and keel petals subequal.....*E. subumbrans*

Erythrina stricta Roxb., [Hort. Beng. 53. 1814, *nom.*] Fl. Ind. 3: 251. 1832; Bedd., Fl. Sylv. t. 175. 1872; Gamble, Fl. Madras 354(250). 1918.

Deciduous trees with yellowish prickles. Leaflets to 10×10 cm. Calyx split half way down on one side. Corolla red; standard to 5×2 cm; wings 0.6 cm long; keel petals 2.2 cm long. Pod subturgid, 2-3-seeded, uniform.

South W. India. Occasional in upper Ghats. January-May. *CJS* 12529, *HFP* 1460.

Erythrina subumbrans (Hassk.) Merrill, Philipp. J. Sci. Bot. 5: 113. 1910; Backer & Bakh. f., Fl. Java 1: 628. 1963. *Hypaphorus subumbrans* Hassk., Hort. Bogor. Desc. 198. 1858. *Erythrina lithosperma* Blume ex Miq., Fl. Ind. Bat. 1(2): 209. 1859; Baker in J. Hooker, Fl. Brit. India 2: 190. 1876.

Unarmed, almost evergreen trees. Leaflets to 14×9 cm. Calyx split on 2 sides. Corolla red; standard to 2.5-3×2 cm; wings and keel petals subequal, 1.2 cm long. Pod flat, broader and empty at base, turgid and 3-4-seeded towards the apex.

Malaysia. Frequent escape in upper Ghats. September-March. *CJS* 11457, *HFP* 874. Introduced, grown in coffee and tea estates as a shade tree.

Note: *Erythrina mysorensis* Gamble was based on a Meebold specimen from Chickanahalli in Hassan District. It was supposed to have a spathaceous calyx split only on one side. As the type has not been located, Krukoff & Barneby (*Phytologia* 25. 1972) have lectotypified *E. mysorensis* on a drawing in Kew annotated by Gamble.

As the drawing shows 'a tomentose calyx shallowly cleft on both sides, therefore, two-lipped,' they have reduced *E. mysorensis* to synonymy under *E. subumbrans*.

FLEMINGIA Roxburgh ex W. T. Aiton *nom. cons. recomm.*

Leaves 1- or digitately 3-foliolate; stipules striate, caducous; leaflets gland-dotted beneath; venation pinnate or subpalmate. Calyx lobes subequal, free, linear-lanceolate, longer than tube. Corolla scarcely exserted. The standard usually auricled. Wings often adherent to keel. Stamens 9+1. Ovary subsessile, short, 2-ovuled; style flat below, thickened above; stigma penicillate. Pod short, oblique, turgid, 1-2-seeded.

1 Leaves simple; venation pinnate. Flowers hidden within floral bracts.....
.....*F. strobilifera*
1 Leaves 3-foliolate; venation of leaflets subpalmate with 3 ribs. Flowers not hidden.
2 Leaflets more than 5 cm broad; flowers in axillary racemes.....*F. macrophylla*
2 Leaflets less than 2 cm broad; flowers in terminal heads.....*F. nilgheriensis*

Flemingia macrophylla (Willd.) Prain ex Merrill, Philipp. J. Sci. Bot. 5: 130. 1910. *Crotalaria macrophylla* Willd., Sp. Pl. 3: 982. 1802. *Flemingia congesta* Aiton, Hort. Kew. ed. 2, 4: 349. 1812; Gamble, Fl. Madras 378(267). 1918. *Maughania macrophylla* (Willd.) Kuntze, Rev. Gen. 1: 199. 1891; Backer & Bakh. f., Fl. Java 1: 638. 1963 ('*Moghania*').

Undershrubs, pale brown-velvety. Stipules cuspidate, 2 cm long; petiole 10 cm long; leaflets elliptic-ovate, acute, lateral ones often oblique at base, silky on the nerves beneath, to 20×7.5 cm; venation subpalmate. Raceme velvety. Flowers congested, purplish-yellow. Pod pubescent, 2-seeded.

Indomalaysia. Occasional in lower Shiradi Ghat. December-February. *CJS* 12628, *HFP* 2657.

Note: Kuntze (1891) actually made the combination *Moghania macrophylla*. Prain (*J. As. Soc. Bengal* 66: 440. 1897) erroneously credits *Flemingia macrophylla* to Kuntze while not accepting the taxon. Merrill (*l. c.* 1910) laboriously credits *Flemingia macrophylla* to "Kuntze ex Prain." Actually it is Merrill who first satisfies all requirements. Alston (in Trimen, *Handb. Fl. Ceylon* 6: 85. 1931) repeated what Merrill did without knowing of Merrill's work.

Flemingia nilgheriensis (Baker) Wight ex Cooke, Fl. Bombay 1: 393. 1902; Gamble, Fl. Madras 379(267). 1918 ('*nilgiriensis*'). *Flemingia procumbens* Wight, Ic. t. 987. 1845, non Roxb., 1832. *Flemingia vestita* var. *nilgheriensis* Baker in J. Hooker, Fl. Brit. India 2: 230. 1876. *Maughania nilgheriensis* (Baker) Li, Amer. J. Bot. 31: 225. 1944 ('*Moghania*').

Trailing herbs. Stipules acuminate, 0.6 cm long; petiole 1.5 cm long; leaflets elliptic-ovate, shortly acuminate, truncate at base; venation subpalmate. Flowers 6-15 in each head; bracts distinct. Calyx 0.7 cm long. Corolla purplish. Pod glabrous, 1-seeded.

South W. India. Rare; collected once in flower at Vanagur (upper Bisle Ghat) on September 4, 1969. Found growing near rock crevices. *CJS* 17836.

Flemingia strobilifera (L.) Aiton, Hort. Kew. ed. 2, 4: 350. 1812; Gamble, Fl. Madras 377(266). 1918. *Hedysarum strobiliferum* L., Sp. Pl. 746. 1753. *Maughania strobilifera* (L.) St. Hil. ex Kuntze, Rev. Gen. 1: 199. 1891; Backer & Bakh. f., Fl. Java 1: 638. 1963 ('*Moghania*').

Leaf 1-foliolate. Panicle cymose, 10-20 cm long; peduncle zig-zag; bracts persistent, hiding flowers and fruits, 2 cm long.

Indomalaysia. Common in Ghats. November-March. *CJS* 16037, 16547.

GALACTIA P. Browne

Twining, sometimes prostrate herbs. Leaves usually pinnately trifoliolate; stipules small; stipels minute. Raceme axillary; bracts and bracteoles indistinct. Flowers paired or few-fascicled per node, bisexual, small. Calyx lobes longer than tube, upper 2 connate, middle of the lower 3 longer. Standard auricled; wings adherent to keel and long clawed. Stamens 9+1. Ovary subsessile, many-ovuled. Pod linear, flat, subseptate between seeds.

Galactia tenuiflora (Willd.) Wight & Arn., Prodr. 206. 1834; Gamble, Fl. Madras 356(251). 1918. *Glycine tenuiflora* Klein ex Willd., Sp. Pl. 3: 1059. 1802.

Leaf rachis 3-4 cm long; leaflets ovate-lanceolate, subacute, truncate at base, to 6×2.5 cm, shining above, silky beneath, chartaceous. Raceme to 12 cm long. Flower to 1.2 cm long. Corolla reddish-purple. Pod 3-5×0.7 cm, glabrescent.

Paleotropics. Common near Nagpuri. July-August. *CJS* 14141.

GEISSASPIS Wight & Arnott

Herbs. Leaves even-pinnate with 2 pairs of leaflets; stipules peltate, striate; stipels 0. Bracts imbricate, suborbicular, persistent, concealing the flowers and fruits. Calyx deeply 2-lipped, upper lip entire, lower shortly 3-toothed. Stamens 10, monadelphous. Sheath split above, sometimes also below. Ovary stalked, 2-ovuled. Pod a loment of 1-2, reticulate, 1-seeded joints. Lower suture sinuate.

Geissaspis tenella Bentham, Flora 32: 559. 1849; Gamble, Fl. Madras 324(229). 1918.

Subscandent with thick rootstock. Stipules spurred at the base, ciliate. Leaf rachis 0.5-1 cm long; leaflets obovate, to 0.7×0.5 cm. Raceme to 4.5 cm long; bracts oblique, dentate, to 1.2 cm across, veined. Corolla yellow, 0.5-1 cm long. Loment to 0.4 cm long.

South W. India. Common in wet fields in upper Ghats. October-January. *CJS* 15461, *HFP* 1408.

GLYCINE Willdenow *nom. cons.*

Leaves pinnately 3-foliolate; stipules small; stipels subulate. Calyx subbilabiate, with upper 2 lobes more connate. Wings subadherent to keel. Stamens 10, monadelphous, later 9+1. Ovary subsessile, several-ovuled. Pod compressed, oblong, dehiscent, entire, septate.

Glycine wightii (Wight & Arn.) Verdcourt, Taxon 15: 35. 1966. *Notonia wightii* Wight & Arn., Prodr. 208. 1834. *Johnia wightii* (Wight & Arn.) Wight & Arn., Prodr. 449. 1834. *Glycine javanica* auct. non. L.: Gamble, Fl. Madras 351(248). 1918.

Climbing, pubescent herbs. Leaf rachis 4 cm long; leaflets 3-5.5×4 cm, terminal rhomboid, lateral ovate and oblique. Raceme to 10 cm long, densely flowered; bracteoles linear. Calyx teeth longer than tube. Corolla white. Pod hairy, torulose, to 3×0.5 cm.

Paleotropics. Occasional in plains. October-December. *CJS* 11972, 15316.

INDIGOFERA Linnaeus

Herbs, shrubs, usually covered with appressed, centrifixed hairs. Leaves 3-many-foliolate, rarely simple; stipules small; stipels setaceous or 0. Flowers solitary in the axil of bracts. Calyx lobes subequal. Corolla pink or red. Standard with a short claw, usually pubescent on the back; wings slightly coherent with keel; keel petals each spurred. Stamens 9+1. Anthers gland-tipped. Ovary sessile, 1-many-ovuled; stigma often penicillate. Pod dehiscent, turgid, septate between seeds, usually apiculate.

1 Leaves 1-foliolate. Pod 1-seeded.....*I. linifolia*
1 Leave 3-many-foliolate. Pod 2-many-seeded.
2 Leaves digitately trifoliolate.
3 Plants with grey pubescence. Pod not winged.....*I. trita*
3 Plants with brownish pubescence. Pod winged.
4 Leaflets obtuse or acute, apiculate. Pod 1 mm thick.....*I. prostrata*
4 Leaflets emarginate, not apiculate. Pod 2-3 mm thick.....*I. trifoliata*

2 Leaves odd-pinnate with many leaflets.
5 Leaflets all alternate, 9 or fewer; stipules 4-5 mm long, scarious, subpersistent.
6 Raceme subcapitate (less than 2 cm). Pod 2-seeded.....*I. linnaei*
6 Raceme elongate (more than 4 cm). Pod many seeded.....*I. spicata*
5 Leaflets opposite, if some alternate, then more than 13; stipules less than 4 mm, herbaceous, deciduous.
7 Flowers ±1 cm; some leaflets alternate.....*I. cassioides*
7 Flowers less than 5 mm long; all leaflets opposite.
8 Leaflets 15 or more; pods greenish-grey, erect.....*I. wightii*
8 Leaflets 11 or less; pods brown, deflexed.....*I. tinctoria*

Indigofera cassioides Rottler ex DC., Prodr. 2: 225. 1825. *Indigofera pulchella* Roxb., [Hort. Beng. 57. 1814, *nom.*] Fl. Ind. 3: 382. 1832; Wight, Ic. t. 367. 1840; Gamble, Fl. Madras 313(221). 1918.

Deciduous, grey-pubescent shrubs. Leaves to 12 cm long; leaflets more than 13, some alternate, elliptic-oblong, to 2×1 cm. Raceme to 7 cm long, 15-20-flowered. Pod glabrous, cylindrical, 6-10-seeded.

India. Common at Byra (Western plains). January-February. *CJS* 12219, 16443.

Indigofera linifolia (L. f.) Retz., Obs. Bot. 4: 29. 1786; Wight, Ic. t. 313. 1840; Gamble, Fl. Madras 309(218). 1918. *Hedysarum linifolium* L. f., Suppl. 331. 1781.

Silvery-canescent, diffuse herbs. Leaves simple, subsessile, lanceolate, to 3×0.2 cm. Raceme 2-3 cm long, 6-8-flowered. Pod silvery, globose, mucronate, 2 mm across.

Paleotropics. Collected once in flower and fruit along Tiptur-Arsikere road on December 19, 1968. *CJS* 11907.

Indigofera linnaei Ali, Bot. Notiser 3: 549. 1958; Backer & Bakh. f., Fl. Java 1: 591. 1963. *Hedysarum prostratum* L., Mant. 102. 1767. *Indigofera enneaphylla* L., Mant. Alt. 272, 571. 1771, *nom. superfl.*; Wight, Ic. t. 403. 1840; Gamble, Fl. Madras 309(218). 1918. *Indigofera prostrata* (L.) Domin, Bibl. Bot. Stuttgart 187. 1926, non Willd., 1803.

Trailing, profusely branched, slender, grey-pubescent herbs. Leaves 2-4 cm long; leaflets 5-7, obovate, to 0.8×0.3 cm. Raceme to 1.5 cm long, 10-15-flowered. Pod subovoid, thinly hoary, 3×1 mm.

West Africa, Indomalaysia. Frequent on dry, sandy soil along the road in plains. July-October. *CJS* 15357, 15379.

Indigofera prostrata Willd., Sp. Pl. 3: 1226. 1802; Gamble, Fl. Madras 310(219). 1918; Sant., Fl. Khandala ed. 3, 55. 1967.

Flexuous, prostrate, branched herbs. Leaves 1.5-2 cm long; leaflets 3, obovate, to 0.8×0.4 cm. Raceme 0.5 cm long, 4-8-flowered. Pod filiform, sparsely hairy, to 1×0.1 cm, 6-8 seeded.

India. Collected once in flower at Magadi Estate (upper Ghat) on October 6, 1965. *CJS* 10009.

Indigofera spicata Forsk., Fl. Aegyp-Arab. 138. 1775; Backer & Bakh. f., Fl. Java 1: 591. 1963. *Indigofera endecaphylla* N. Jacq., Ic. Rar. 3(3): t. 570. Mar. 1789 ('*hendecaphylla*'); *l.c.*, 3(16): 14. 1795; Collect. 2: 358. Apr. 1789; Gamble, Fl. Madras 311(220). 1918.

Erect or straggling, branched herbs with appressed pale-brown pubescence. Leaves 5 cm long; leaflets 9, elliptic-oblong, to 2.2×0.6 cm. Raceme to 8 cm long, 15- or more-flowered. Pod tetragonous, deflexed, glabrescent, 2-3 cm long, 6-10-seeded.

Paleotropics. Common in upper Ghats. September-November. *CJS* 9147, 9994.

Note: Backer & Bakhuisen (*l. c.*) cite *I. endecaphylla* Lam. as a synonym.

Indigofera tinctoria L., Sp. Pl. 751. 1753; Wight, Ic. t. 365. 1840; Gamble, Fl. Madras 312(220). 1918.

Grey pubescent undershrubs. Leaves to 8 cm long; leaflets 7-11, obovate-oblong, to 1.6×1 cm. Raceme to 4 cm long, 15-more-flowered. Pod linear, slightly curved, sparsely hairy, to 3 cm long, 8-10-seeded.

Tropics, once widely cultivated. Collected in flower and young fruit along Arsikere-Belvathalli road on December 19, 1968. *CJS* 11983.

Indigofera trifoliata L. in Torner, Cent. II Pl. 29. 1756; Wight, Ic. t. 314. 1840; Gamble, Fl. Madras 310(219). 1918.

Diffuse herbs. Leaves to 1.5 cm long; leaflets 3, oblong, to 1.5×0.3 cm. Raceme congested, to 1 cm long, 6-10-flowered. Pod linear, deflexed, faintly hoary, to 1 cm long, 6-10-seeded.

Indomalaysia, China. Collected once in flower and fruit at Shiggegudda (plain) on October 8, 1964. *CJS* 9234, 9235.

Indigofera trita L. f., Suppl. 335. 1781; Wight, Ic. t. 315, 386. 1840; Gamble, Fl. Madras 310(219). 1918.

Grey-pubescent undershrubs. Leaves to 1 cm long; leaflets 3, oblong or obovate, slightly emarginate, to 1 × 0.5 cm. Raceme 2-3 cm long, 15-20-flowered. Pod subtetragonous, deflexed, hairy, to 3 cm long, 6-10-seeded.

Paleotropics. Collected once in fruit on bunds of fields at Arsikere on December 19, 1968. *CJS* 11936.

Indigofera wightii Graham ex Wight & Arn., Prodr. 202. 1834; Gamble, Fl. Madras 313(221). 1918.

Straggling, silvery-pubescent undershrubs. Leaves to 6 cm long; leaflets 15-more, opposite, elliptic-oblong, to 1.4×0.6 cm. Raceme to

2.5 cm long, 12-15-flowered. Pod linear, grey-pubescent, 3-4 cm long, 8-10-seeded.

South W. India, Sri Lanka. Frequent in dry deciduous forests. April-August. *CJS* 13548, 14389.

MUCUNA Adanson *nom. cons.*

Leaves pinnately trifoliolate; leaflets unequal. Calyx lobes slightly longer than tube, upper 2 connate, lowest one longer. Standard complicate, shorter than wings, auricled; wings adherent to keel. Stamens 9+1; anthers dimorphous, alternately long, basifixed and short, versatile. Ovary sessile, villous, few-ovuled. Pod turgid, often with stinging hairs, usually ribbed along the sutures; seeds 1-few.

1 Stem perennial. Pod suborbicular, obliquely ribbed on both surfaces.... *M. monosperma*
1 Stem annual. Pod oblong, not ribbed..... *M. pruriens*

Mucuna monosperma DC. [Prodr. 2: 406. 1825, *nom.*] ex Wight, Bot. Misc. 2: 346, Suppl.: t. 12. 1830; Gamble, Fl. Madras 355(251). 1918. *Carpopogon monospermum* Roxb., [Hort. Beng. 54. 1814, *nom.*] Fl. Ind. 3: 283. 1832.

Perennial, large, climbing, pubescent shrubs. Leaf rachis 10-15 cm long; leaflets to 12×6 cm. Raceme 10-30 cm long. Flowers to 4 cm long, purple, often white tipped. Pod 5-6 cm across, to 1.5 cm thick, covered with brown stinging hairs, 1-seeded.

Eastern Himalayas, Burma, South W. India, Sri Lanka. Frequent in upper Ghats. October-April. *HFP* 912, 2773.

Mucuna pruriens (L.) DC., Prodr. 2: 405. 1825. *Dolichos pruriens* L. in Stickman, Diss. Herb. Amb. 23. 1754. *Stizolobium pruriens* (L.) Medicus, Vorles. Churpfalz. Phys.-Ocon. Ges. 2: 399. 1787; Hara, Fl. E. Himalayas 164. 1966. *Mucuna prurita* W. Hooker, Bot. Misc. 2: 348. 1830-31, *nom. superfl.*; Gamble, Fl. Madras 356(251). 1918.

Annual, pubescent twiners. Leaf rachis 4-8 cm; leaflets to 6×5 cm. Raceme 3-6 cm long. Flowers to 3 cm long, purple. Pod to 6×1.5 cm, 0.5 cm thick, slightly curved at both the ends, few-seeded.

Tropics. Rare; collected in flower and fruit in Halebid (plain) on January 22, 1970. *CJS* 16112.

Note: In describing *Mucuna prurita* as an Old World species distinct from *M. pruriens*, supposedly a New World species, Hooker overlooked that *M. pruriens* is, in fact, typified by the very illustration in Rumphius from which he (Hooker) took his specific epithet. Verdcourt (*Kew Bull.* 24 : 286. 1970) treats *Stizolobium* as a subgenus of *Mucuna*.

MUNDULEA Bentham

Silky-pubescent shrubs or small trees. Leaves odd-pinnate. Raceme

terminal. Flowers fascicled on axis. Calyx shortly toothed. Standard transversel callose at base; wings adherent to keel. Stamens 10, monadelphous, the vexillary (upper) filament free only at base; alternate filaments slightly dilated above. Ovary sessile, few-many-ovuled. Pod flat, linear, sutures thickened, late dehiscent.

Mundulea sericea (Willd.) A. Cheval, Compt. Rend. 180: 1521. 1925. *Cytisus sericeus* Willd., Sp. Pl. 3: 1121. 1802. *Tephrosia suberosa* DC., Prodr. 2: 249. 1825. *Mundulea suberosa* (DC.) Bentham in Miq., Pl. Jungh. 248. 1852; Gamble, Fl. Madras 314(222). 1918.

Leaf rachis to 10 cm long; leaflets in 13-17 pairs, ovate-oblong, truncate, to 4×1.7 cm, glabrous above. Raceme to 5 cm long. Corolla white or pale rose, 2 cm long. Pod velvety, to 10×0.3 cm.

Tropical Africa, South W. India, Sri Lanka. Occasional near Belvathalli (scrub). May-June. *CJS* 13534.

ORMOSIA G. Jack *nom. cons.*

Leaves odd-pinnate. Calyx lobes lanceolate, longer than tube, subequal, upper 2 connate. Stamens 10, free, unequal. Ovary short-stalked, 2-few-ovuled. Pod woody. Seeds shining, scarlet or scarlet and black.

Ormosia travancorica Bedd., Fl. Sylv. t. 45. 1870; Gamble, Fl. Madras 390(275). 1918.

Trees to 15 m. Leaves to 25 cm long; leaflets 13-15, elliptic-oblong, acuminate, truncate at base, to 10×3.5 cm, coriaceous. Raceme to 15 cm long. Flowers many, 1-1.5 cm long, pale pink. Pod elliptic, shortly apiculate, red, to 7×5 cm, with single scarlet seeds.

South W. India. Occasional in Bisle Ghat. January-May. *CJS* 16248, *HFP* 1665.

PARACALYX Ali

Climbing, tomentose undershrubs. Leaves pinnately trifoliolate; leaflets subequal, with resin dots beneath. Calyx scarious, accrescent, veined, enclosing the corolla and pod; upper 2 lobes connate, lowest one longer. Standard auricled, with 2 callosities. Stamens 9+1. Ovary subsessile, 1-ovuled; style ciliate below the middle, swollen at the middle, curved. Pod falcate-ovate.

Paracalyx scariosa (Roxb.) Ali, Univ. Studies, Karachi 5(3): 95. 1968. *Cylista scariosa* Roxb., Pl. Cor. t. 92. 1795; Wight, Ic. t. 1597. 1850; Gamble, Fl. Madras 371(262). 1918.

Leaf rachis to 6 cm long; leaflets rhomboid-ovate, acuminate, to 5×4

cm, distinctly nerved beneath. Raceme 5-20 cm long. Calyx to 3 cm long. Corolla yellow.

South India. Frequent in upper Ghats and plains. January-April. *CJS* 11587, 16260.

Note: The type species of *Cylista* Aiton is a member of the genus *Rhynchosia.* A proposal for conservation failed (*Taxon* 17: 464. 1968). Thus, a new generic name was necessary for the species of *Cylista* other than the type.

PSEUDARTHRIA Wight & Arnott

Leaves pinnately trifoliolate. Calyx lobes equaling the tube, subequal, upper 2 almost connate. Stamens 9+1. Ovary subsessile, several-ovuled. Pod flat, thin, entire-subsinuate; seeds 4-8.

Pseudarthria viscida (L.) Wight & Arn., Prodr. 209. 1834; Wight, Ic. t. 286. 1840; Gamble, Fl. Madras 334(236). 1918. *Hedysarum viscidum* L., Sp. Pl. 747. 1753.

Viscid-pubescent, climbing undershrubs. Leaf rachis to 10 cm long; leaflets rhomboid, to 9×4 cm, membranous. Raceme to 20 cm long. Corolla pink. Pod linear, to 2×0.6 cm, viscid.

Indomalaysia, Jamaica. Occasional in plains. October-November. *HFP* 1082, 2282.

PTEROCARPUS Jacquin *nom. cons.*

Trees. Leaves imparipinnate; leaflets alternate and/or subopposite. Calyx toothed, upper 2 connate. Stamens monadelphous or diadelphous (5+5 or 9+1). Ovary usually stalked, 2-few-ovuled. Pod orbicular, winged all around, indehiscent, with lateral, sub-basal beak; seeds 1-2.

Pterocarpus marsupium Roxb., Pl. Cor. t. 116. 1799; Bedd., Fl. Sylv. t. 21. 1869; Gamble, Fl. Madras 385(271). 1918.

Leaf rachis to 12 cm long; leaflets 5-7, elliptic-ovate, to 9×6 cm, coriaceous. Panicle terminal, 12-15 cm long. Flowers 1.5 cm long, with dark-brown calyx and yellow corolla. Stamens monadelphous, at length isadelphous. Pod 4 cm across, convexly curved.

South W. India, Sri Lanka. Common in dry deciduous forests. July-January. Cultivated for its timber. *CJS* 12157, *HFP* 1089.

PYCNOSPORA R. Brown ex Wight & Arnott

Suberect or trailing, pubescent herbs. Leaves pinnately trifoliolate; stipules striate. Calyx lobes longer than tube, upper 2 connate. Wings adherent to keel. Stamens 9+1, but vexillary stamen coherent at first.

Ovary sessile, several-ovuled. Pod oblong, turgid, veined; seeds 5-8, strophiolate.

Pycnospora lutescens (Poiret) Schindler, J. Bot. 64: 145. 1926; Backer & Bakh. f., Fl. Java 1: 609. 1963. *Hedysarum lutescens* Poiret in Lam., Encycl. 6: 417. 1805. *Pycnospora hedysaroides* R. Br. ex Baker in J. Hooker, Fl. Brit. India 2: 153. 1876; Gamble, Fl. Madras 333(235). 1918.

Leaf rachis 0.5-1.5 cm; leaflets obovate, truncate, cuneate, to 3.5×2 cm, membranous. Raceme to 7 cm long. Corolla purple. Pod to 1× 0.5 cm, pubescent.

Indomalaysia, China. Occasional along the Ghats. April-October, *CJS* 13438, 15530.

RHYNCHOSIA Loureiro *nom. cons.*

Often twining shrublets. Leaves pinnately trifoliolate; leaflets with resin dots beneath, lateral ones oblique. Calyx lobes much longer than tube, upper 2 connate, lowest longer. Standard auricled. Stamens 9+1. Ovary subsessile, usually 2-ovuled. Pod oblong, compressed, not or hardly exceeding the calyx: seeds 1-2.

1 Calyx 0.8 cm long. Pod 1-seeded.....*R. rufescens*
1 Calyx 1.5 cm long. Pod 2-seeded.....*R. hirta*

Rhynchosia hirta (Andrews) Meikle & Verdcourt, Taxon 16: 462. 1967. *Cylista villosa* Aiton, Hort. Kew. 3: 36. 1789 [non *Rhynchosia villosa* (Meisner) Druce, 1917]. *Dolichos hirtus* Andrews, Bot. Repos. 7: t. 446. 1807. *Cylista tomentosa* Roxb., Pl. Cor. t. 221. 1811. *Rhynchosia cyanosperma* Bentham ex Baker, Fl. Trop. Africa 2: 218. 1871; Gamble, Fl. Madras 375(264). 1918.

Stem woody, twining, with brown hairs. Stipules to 1.5 cm long; rachis 6 cm long; leaflets ovate, cuspidate, to 10×6 cm. Raceme 20-25 cm long, many-flowered; bracts elliptic-ovate, cuspidate, 2×1 cm. Calyx lobes foliaceous, not accrescent. Corolla scarlet, marcescent. Pod grey-tomentose; seeds bright blue-black, estrophiolate.

South W. India, Sri Lanka, S. Africa. Occasional in scrub or dry deciduous forests. October-March. *CJS* 12414, 15228.

Rhynchosia rufescens (Willd.) DC., Prodr. 2: 387. 1825; Gamble, Fl. Madras 373(263). 1918. *Glycine rufescens* Willd., Ges. Naturf. Freunde Berlin Neue Schriften 4: 222. 1803.

Branches slender, pubescent, trailing or twining; stipules small, rachis 3-5 cm; leaflets elliptic-ovate, subacute, to 4 × 2.7 cm, subvelvety. Raceme 7 cm long, few-flowered; bracts indistinct. Calyx slightly accres-

cent; lobes lanceolate. Corolla yellow, deciduous. Pod pubescent; seed strophiolate.

Indomalaysia. Fairly common at Nagpuri & Belvathalli. July-March. *CJS* 13967, 17879.

ROTHIA Persoon *nom. cons.*

Leaves digitately 3-foliolate; stipules foliaceous. Calyx lobes narrow, subequal, longer than tube, upper two broader and falcate. Stamens monadelphous, staminal tube cleft above. Ovary sessile, many-ovuled. Pod linear, compressed; seeds many.

Rothia indica (L.) Druce, Bot. Exch. Club Soc. Brit. Isles 3: 423. 1914.
Trigonella indica L., Sp. Pl. 778. 1753. *Rothia trifoliata* Pers., Syn. Pl. 2: 302. 1807; Wight, Ic. t. 199. 1839; Gamble, Fl. Madras 279(199). 1918.

Annual villous herbs. Petiole to 1 cm long; leaflets oblanceolate, to 1×0.4 cm, membranous. Corolla yellow. Pod to 4.5×0.2 cm, appressed-villous, straight.

India, Sri Lanka, Australia. Weed, collected in flower and young fruit at Belvathalli (scrub) on August 13, 1971. *HFP* 1956.

SHUTERIA Wight & Arnott *nom. cons.*

Twining herbs. Leaves pinnately trifoliolate. Calyx teeth shorter than oblique tube, upper 2 connate, lower one longer. Wings adherent to keel. Stamens 9+1. Ovary subsessile, many-ovuled. Pod linear, compressed, septate.

Shuteria vestita Wight & Arn., Prodr. 207. 1834; Wight, Ic. t. 165. 1839; Gamble, Fl. Madras 350(247). 1918.

Sparsely hirsute. Stipules, stipels, bracts and bracteoles pink. Leaf rachis 3-4 cm long; leaflets elliptic-ovate, obtuse at both ends, to 3.5×2 cm. Raceme 1-4 cm long. Corolla purplish-red. Pod pink, pubescent, to 3×0.5 cm.

Indomalaysia. Collected once in a cardamom estate (upper Bisle Ghat) on February 17, 1972 (fruit). *HFP* 2618.

SMITHIA Aiton *nom. cons.*

Herbs or undershrubs. Leaves even-pinnate; stipules scarious, persistent, peltate, the appendix 2-auricled, one short and round and the other linear and longer; leaflets in few to many pairs, sensitive. Bracteoles persistent. Calyx 2-lipped, the lips subentire. Staminal tube mostly

united, split into 5+5 above. Ovary short-stalked, few-ovuled. Pod a loment of several, minute, 1-seeded joints, twisted inside the accrescent calyx.

1 Inflorescence capitate. Corolla blue.....*S. capitata*
1 Inflorescence not capitate. Corolla yellow.
2 Stem not bristly. Flowers paired in upper axils.....*S. conferta*
2 Stem bristly. Flowers in panicled raceme.....*S. setulosa*

Smithia capitata Dalzell, Hooker's J. Bot. Kew Gard. Misc. 3: 208. 1851; Bedd., Ic. t. 244. 1874; Gamble, Fl. Madras 330(233). 1918. Steenis, Reinwardtia 5: 445. 1961.

Annual, climbing herbs. Leaf rachis 4 cm long; leaflets 9-13 pairs, to 1×0.3 cm. Head many-flowered. Calyx membranous; lip bristly along the margin. Joints of loment smooth, round, turgid.

South India. Occasional in plains and upper Ghats. August-October. *HFP* 2186, 2275.

Note: Smithia capitata Desv., 1813 is a *nom. nud.*

Smithia conferta J. E. Sm. in Rees, Cyclop. 33: n. 2. 1819; Gamble, Fl. Madras 329(232). 1918; Steenis, Reinwardtia 5: 445. 1961; Sant., Fl. Khandala ed. 3, 58. 1967. *Smithia geminiflora* Roth, Nov. Pl. Sp. 352. 1821; Gamble, *l. c.*

Annual, diffuse herbs, not bristly. Leaf rachis to 3 cm long; leaflets 4-6 pairs, to 0.8×0.2 cm. Calyx rigid, lips entire, subequal. Joints of loment turgid, round, papillose.

Indomalaysia. Fairly common in fields in plains and upper Ghats. September-March. *CJS* 15684, *HFP* 2492.

Smithia setulosa Dalzell, Hooker's J. Bot. Kew. Gard. Misc. 3: 208. 1851; Bedd., Ic. t. 243. 1874; Gamble, Fl. Madras 329(232). 1918.

Annual, erect, bristly herbs. Leaf rachis to 8 cm long; leaflets in 5-7 pairs, oblong-lanceolate, obtuse, to 3×0.6 cm. Panicle to 20 cm long, short-bristly except corolla. Calyx rigid; upper lip large, obtuse; lower small, acute. Joints of loment turgid, spherical, reticulate.

South W. India. Collected once in flower on Bisle Ghat on October 30, 1969. Bristles of the plant yellowish-brown and very conspicuous. *CJS* 15511.

STYLOSANTHES Swartz

Leaves pinnately trifoliolate; stipules sheathing, adnate to the petiole. Flowers polygamous, small, 1-few per head. Calyx tube filiform; upper 4 lobes connate, lowest narrow and distinct. Stamens monadelphous in closed tube; anthers dimorphous, alternately long, basifixed and short, versatile. Ovary subsessile, 2-3-ovuled; style long, lower part

persistent, dilated at apex and resembling stigma. Pod of 1-2 joints, small, concealed in bracts, turgid, rugose, tipped with the persistent, hooked, basal part of the style; seed strophiolate.

Stylosanthes fruticosa (Retz.) Alston in Trimen, Handb. Fl. Ceylon 6: 77. 1931; Verdcourt, Kew Bull. 24: 59. 1970. *Arachis fruticosa* Retz., Obs. Bot. 5: 26. 1788. *Stylosanthes mucronata* Willd., Sp. Pl. 3: 1166. 1802, *nom. illegit*; Bedd., Ic. t. 294. 1874; Gamble, Fl. Madras 326(230). 1918.

Diffuse, rigid, pubescent undershrubs. Leaf rachis to 0.7 cm long; leaflets elliptic-oblong, to 0.6×0.3 cm. Heads 2 cm long. Corolla yellow.

Paleotropics. Frequent in scrub. All seasons. *CJS* 11901, 13959.

TEPHROSIA Persoon *nom. cons.*

Leaves usually odd-pinnate; venation strikingly striate. Calyx lobes or teeth subequal or upper 2 connate. Wings slightly adherent to keel. Stamens 10, monadelphous at early stage, the vexillary (upper) filament becoming free. Ovary sessile, usually many-ovuled; style often flattened, glabrous or bearded; stigma usually penicillate. Pod linear, flat.

1 Small herbs with woody rootstock. Leaves 1-foliolate with winged petiole; ovary glabrous..... *T. calophylla*
1 Undershrubs. Leaves odd-pinnate with petiole not winged; ovary pilose.
2 Leaflets 3 or 5, elliptic-lanceolate, obtuse, tomentose; terminal one twice the size of lateral ones..... *T. pulcherrima*
2 Leaflets more than 5, obovate, retuse, membranous, subequal.
3 Branches white-tomentose. Pod tomentose..... *T. hirta*
3 Branches grey-pubescent. Pod glabrescent..... *T. purpurea*

Tephrosia calophylla Bedd., Ic. t. 166. 1874; Gamble, Fl. Madras 318(224). 1918.

Glabrescent herbs. Petiole 6 cm long; blade indurate along the margin, oblanceolate, obtuse, cuneate, to 12×2 cm, coriaceous. Flowers lax. Corolla brick red. Pod to 5×0.5 cm, nearly straight.

S. India. Common at Ramanahalli and Bourdalboore State Forests (plains). In dry stony ground. April-July. *HFP* 145, 1931.

Tephrosia hirta Ham., Trans. Linn. Soc. London 13: 546. 1822; Gamble, Fl. Madras 318(225). 1918. *Tephrosia villosa* Wight & Arn., Prodr. 212. 1834 (*an* Persoon 1807?).

Erect, white-tomentose undershrubs. Leaves 7 cm long; leaflets 13-15, obovate, obtuse or retuse, 1.5×0.5 cm. Flowers lax. Calyx villous.

Corolla white-lilac. Pod woolly-tomentose, curved, to 3×0.6 cm.

Paleotropics. Frequent in scrub. May-July. *CJS* 13759, 13925.

Note: There is a difference of opinion as to the identity of *Tephrosia villosa* (L.) Pers. and *T. hirta* Ham. If the two are the same Persoon's binomial is priorable.

Tephrosia pulcherrima (Baker) Gamble, Fl. Madras 319(225). 1918.
Tephrosia tinctoria var. *pulcherrima* Baker in J. Hooker, Fl. Brit. India 2: 112. 1876.

Erect, silver-tomentose undershrubs. Leaf rachis 4-6 cm long; leaflets 3 or 5, obtuse at both ends, terminal one larger, to 8×3.5 cm. Bracts conspicuous. Flowers congested towards the apex. Corolla orange. Pod slightly curved, to 6 cm long.

South W. India, Sri Lanka. Frequent in plains and upper Ghats. July-October. *CJS* 15411, *HFP* 2329.

Tephrosia purpurea (L.) Pers., Syn. Pl. 2: 329. 1807; Gamble, Fl. Madras 320(226). 1918. *Cracca purpurea* L., Sp. Pl. 752. 1753.

Glabrescent, erect undershrubs. Leaves 6 cm long; leaflets 13-19, to 1.8×0.7 cm. Raceme with 1-4 flowers at node. Corolla pink. Pod slightly curved, glabrous, 4 cm long.

Tropics. Frequent in plains and upper Ghats. All seasons. *CJS* 10861, *HFP* 1505.

TERAMNUS P. Browne

Climbing herbs. Leaves pinnately 3-foliolate. Calyx lobes longer than tube, upper 2 free or connate. Wings slightly adherent to keel. Stamens monadelphous; alternate anthers sterile. Ovary sessile, many-ovuled. Pod linear, slightly turgid, septate, hooked with persistent style; seeds 8-12.

Teramnus mollis Bentham, J. Linn. Soc., Bot. 8: 265. 1865; Gamble, Fl. Madras 353(249). 1918; Verdcourt, Kew Bull. 24: 276. 1970.
Glycine mollis Wight & Arn., Prod. 209. 1834, p. p. excl. typ.

Leaf rachis to 4 cm long, strigosely villous; leaflets subequal, elliptic-ovate, subacute, truncate at base, 3.5×2 cm, hairy on nerves above, appressed pubescent beneath, membranous. Raceme to 12 cm long. Corolla reddish. Pod to 4×0.4 cm.

Tropics. Rare; collected once in fruit along a road in Bisle Ghat on December 21, 1968. *CJS* 12140.

VIGNA Savi

Note: The classic distinction between *Vigna* and *Phaseolus,* the spiral *vs* curved nature of the keel, is not satisfactory. The final solution awaits monographic work, but in the meantime we are following the recent work of B. Verdcourt (*Kew Bull.* 24: 507-569. 1970).

Leaves pinnately 3-foliolate, stipules often peltate or spurred. Calyx toothed or lobed, upper 2 free or connate. Standard with inflexed auricles; keel petals firmly cohering, erect-incurved, rarely spiral, beaked, often with a lateral pocket. Stamens 9+1. Ovary sessile, many-ovuled; style variously curved, often bearded below the oblique stigma. Pod linear, subterete, more or less transversely septate between seeds.

1 Stipules not distinctly peltate, but shortly appendaged or shortly bilobed at base; style with short lobe-like appendage and appearing subcapitate or if lobe is folded then very shortly beaked. Calyx with slender teeth over 0.5 cm long; petals to 2.5 cm long ..... *V. vexillata*
1 Stipules peltate or spurred; style with thickened part strongly curved, prominently bearded. Calyx with short blunt lobes; petals 2 cm long.
2 Leaflets lobed ..... *V. trilobata*
2 Leaflets entire.
3 Bracteoles linear; pods glabrous; pubescence of plant white ..... *V. umbellata*
3 Bracteoles broad; pods hairy; pubescence of plant reddish ..... *V. radiata*

Vigna radiata (L.) Wilczek, Fl. Congo Belge. 6: 386. 1954; Verdcourt, Kew Bull. 24: 558. 1970. *Phaseolus radiatus* L., Sp. Pl. 725. 1753; Gamble, Fl. Madras 363(256). 1918.

Suberect or twining, pubescent herbs. Stipules peltate, ovate; leaf rachis 6-8 cm long; leaflets elliptic-ovate, to 4.5×3.5 cm. Peduncle 10-15 cm, many-flowered. Corolla yellow; keel curled upwards. Pod compressed, 4-6 cm long.

Paleotropics. Cultivated; occasional as escape. Collected once in flower and fruit at Arkalgud on August 20, 1969. *CJS* 14514.

Vigna trilobata (L.) Verdcourt, Taxon 17: 172. 1968; Kew Bull. 24: 560. 1970. *Dolichos trilobata* L., Mant. 101. 1767. *Phaseolus trilobus* sensu Aiton but not his basionym *Dolichos trilobus*: Gamble, Fl. Madras 362(256). 1918.

Diffuse, trailing, pubescent herbs. Stipules peltate, sometimes spurred, ovate; leaf rachis 3-4 cm long; lobes of leaflets simple, various. Peduncle to 7 cm long; bracteoles ovate. Corolla yellow. Staminal tube cordate. Pod cylindrical, sparsely hispid, to 5 cm long.

Paleotropics. Rare; collected once in flower and fruit in fields at Arsikere on December 19, 1968. *CJS* 11955.

Vigna umbellata (Thunb.) Ohwi & Ohashi, J. Jap. Bot. 44: 31. 1969; Verdcourt, Kew Bull. 24: 960. 1970. *Dolichos umbellatus* Thunb., Trans. Linn. Soc. London 2: 339. 1794. *Phaseolus calcaratus* Roxb., Fl. Ind. 3: 289. 1832; Gamble, Fl. Madras 363(256). 1918.

Hairy twiners. Stipules peltate, lanceolate; leaf rachis to 4 cm long; leaflets ovate-acuminate, to 10×5.5 cm. Peduncle 10-20 cm, few-flowered; bracteoles linear. Corolla yellow, all petals long-clawed.

Staminal tube cordate at base. Pod compressed, glabrous, to 6 cm long.

Indomalaysia. Fairly common at Panorama Point of Bisle Ghat. September-November. *HFP* 982, 2308.

Vigna vexillata (L.) A. Rich. in Sagra, Hist. Fis. Polit. Nat. 1, 11: 191. 1845; Gamble, Fl. Madras 364(257). 1918; Verdc., Kew Bull. 24: 553. 1970. *Phaseolus vexillatus* L., Sp. Pl. 724. 1753.

Sparsely pubescent twiners. Stipules not distinctly peltate, shortly bilobed at base; leaf rachis to 4 cm long; leaflets ovate, acuminate, to 11×5 cm. Peduncle 12-15 cm long, 1-few-flowered. Corolla white, purplish or rose. Pod compressed, black, hirsute, glabrous with age, oblong, to 9 cm long.

Tropics. Occasional in upper Shiradi Ghat. August-October. *HFP* 802, 1008.

Note: *Vigna unguiculata* (L.) Walp. ssp. *unguiculata* (*Dolichos biflorus* L.) is frequently cultivated.

ZORNIA J. F. Gmelin

Diffuse, wiry herbs. Leaves digitately 2 or 4-foliolate; stipules usually peltate; leaflets gland-dotted. Flowers lax; each sessile and enclosed by a pair of basal, foliaceous, gland-dotted bracts. Calyx hyaline; upper 2 lobes connate, lowest one equaling upper lip, side ones shorter. Stamens monadelphous, tube split above; anther dimorphous, alternately long, basifixed and short, versatile. Ovary sessile, many-ovuled. Pod a loment of several, 1-seeded joints, smooth or prickled; upper suture straight, lower deeply sinuate.

Zornia gibbosa Spanoghe, Linnaea 15: 192. 1841; Mohlenbrock, Webbia 16: 112. 1961; Dandy & Milne-Redhead, Kew Bull. 17: 73-74. 1963; Sant., Fl. Khandala ed. 3, 57. 1967. *Zornia diphylla* auct. non (L.) Persoon: Gamble, Fl. Madras 325(229). 1918.

Petiole to 1 cm long; leaflets lanceolate, to 2×0.2 cm, with black glands. Spike 5-8 cm long. Corolla yellow; standard cordate. Pod 0.2 cm broad; prickles scabrid.

Tropics. Frequent in dry plains. June-August. *CJS* 13907, 14697.

Note: The endemic South Indian species termed *Zornia zeylonensis* Pers. by Gamble (*l. c.*) and *Z. diphylla* var. *zeylonensis* (Pers.) Baker (in J. Hooker, *Fl. Brit. India* 2: 148. 1876), with shorter ovate leaves is the true *Z. diphylla* (L.) Pers. according to recent typification.

* * *

Lablab purpureus (L.) Sweet (*Dolichos lablab* L.) and *Cicer arietinum* L. (Chick pea) are often cultivated as vegetables. *Gliricidia sepium*

(Jacq.) Kunth ex Walp. and *Sesbania javanica* Miq. (*S. paludosa* (Roxb.) Prain, *non* DC.) are cultivated for green manure and shade in plantations.

63. PODOSTEMACEAE

T. P. Ramamoorthy

Submerged, thalloid plants. Leaves bract-like, simple. Flowers solitary, bisexual, regular or irregular, enclosed by a spathe (topmost leaf). Tepals 0 or 3, imbricate. Stamens 3 in regular flowers, alternating with tepals, free; (1-) 2 in irregular flowers, united by filaments on one side of flower. Anthers cells 2. Ovary superior, 2-3-locular; ovules few-many on axile, thick placenta; styles short or long. Fruit a many-seeded, loculicidally dehiscent capsule.

1 Leaves forming involucral whorl; flowers stalked.....**Terniola**
1 Leaves distichous; flowers sessile.....**Hydrobryopsis**

HYDROBRYOPSIS Engler

Thallus crustose. Leaves 5-6, distichous, carinate, the uppermost helmet-shaped, enclosing sessile flower. Perianth 0. Stamens 2, united almost to anthers; staminode 1, linear. Ovary globose, 2-locular; style eccentric. Capsule smooth, round, oblique.

Hydrobryopsis sessilis (Willis) Engl. in Engl. & Prantl, Pflanzenfam. 18a: 60, t. 53 A-C. 1930; Subramanyam, Aquat. Angio. 47. 1962. *Hydrobryum sessile* Willis, Ann. Roy. Bot. Gard. (Peradeniya) 1: 239. 1902; Gamble, Fl. Madras 1198(839). 1925.

Thallus 0.3-0.5 mm wide, creeping, closely attached to rocks. Flowers white, sessile.

South India. Locally common in lower Shiradi Ghat, on rocks, submerged or constantly moistened by mountain torrents. November-May. *CJS* 15606, *HFP* 2681.

TERNIOLA Tulasne

Thallus frondose. Leaves numerous, whorled, usually in closed, packed rosettes in older parts. Pedicel elongating in fruit. Tepals 3. Stamens 3; filaments free, alternating with tepals; staminodes 0. Ovary 3-locular; stigmas 3. Capsule ribbed, 3-valved; valves incurving after dehiscence.

Terniola zeylanica Tul., Pod. Monogr. 190, t. 13. 1852; Sant., Fl. Khandala ed. 3, 228. 1967. *Lawia zeylanica* var. *zeylanica* Willis,

Podost. Ind. & Ceylon 215. 1901-1902; Gamble, Fl. Madras 1193 (837). 1924.

Thallus closely adhering and branching. Flowers white, stalked. Fruiting pedicel to 8 mm long. Capsule ellipsoid.

Western Peninsular India, in the Ghats. Growing on rocks, intermixed with the preceding species. November-May. *CJS* 11770, 15607.

Note: *Lawia* Tul. (1849) is a later homonym of *Lawia* Wight (1847).

64. HALORAGACEAE

D. H. Nicolson

MYRIOPHYLLUM Linnaeus

Aquatic herbs. Stipules 0. Leaves alternate, opposite or whorled on same specimen; aerial leaves simple, toothed to entire and submerged leaves pectinately dissected; venation not differentiated into primary and secondary. Flowers axillary, polygamous, usually fascicled, regular, subtended by a pair of bracteoles. Sepals usually with 4 minute lobes. Petals usually 2 or 4. Stamens 2, 4 or 8, opposite petals. Ovary 2-4-lobed, inferior; styles sessile, 2-4, with plumose stigmas; locules 2-4, with 1 pendulous axile ovule. Fruit a dry capsule breaking into 2-4 tuberculate cocci.

Myriophyllum oliganthum (Wight & Arn.) F. v. Mueller, Fragm. Phyt. Austr. 10: 54. 1876; van der Meijden, Blumea 17: 308. 1969. *Haloragis oligantha* Wight & Arn., Prod. 338. 1834. *Myriophyllum intermedium* auct. non DC.: Wight, Ill. 2: 23, t. 102 (excl. fig. 8 of fruit). 1850; Gamble, Fl. Madras 454(321). 1919; Subramanyam, Aquatic Angio. 17. 1962.

Bracts simple, entire to dentate. Flowers several per axil, central flower stalked. Staminate flowers with 4 caducous petals, 4 stamens. Pistillate flowers with 4 caducous petals. Fruits 1 mm long, tuberculate when dry, of 4 columnar carpels with rounded backs.

S. India. Common in standing water of tanks on plains. All seasons. *CJS* 15453, *HFP* 1124.

Note: Meijden studied the type of *M. intermedium* DC. and found it to be synonymous with *M. indicum* Willd.

CJS 12863 appears to have solitary sessile flowers with caducous perianth. All flowers are pistillate and young. It was collected in a dry pond and it is regarded as a stunted *M. oliganthum*.

Fig. 50. HALORAGACEAE. *A. Myriophyllum oliganthum*: habit; *Aa*, 4-flowered cluster; *Ab*, bisexual flower; *Ac*, male flower; *Ad*, female flower; *Ae*, fruit; *Af*, section of fruit.

65. LYTHRACEAE

K. N. Gandhi

Leaves usually opposite, estipulate; blade simple, entire; venation pinnate. Flowers bisexual, regular, with persistent hypanthium, 3-6-merous. Calyx lobes valvate, often alternating with short appendages. Petals 3-6, rarely 0, free, inserted in sinus between calyx lobes, frequently clawed, crumpled in bud, and fugaceous. Stamens 1-6-many, inserted on hypanthium; filaments equal or unequal, anthers inflexed in bud, versatile. Ovary superior, 1-locular to 2-6-locular, with many ovules on axile, or free central placentas; style elongate; stigma truncate or capitate. Fruit a capsule.

1 Trees. Stamens many; placentation axillary.....**Lagerstroemia**
1 Herbs. Stamens 3-6; placentation free-central.
2 Capsule septicidal, thinly cross-striate. Petals present (ours).....**Rotala**
2 Capsule circumscissile or bursting irregularly, the walls smooth. Petals absent (ours).....**Ammannia**

AMMANNIA Linnaeus

Herbs of wet places. Inflorescence a cyme or of solitary flowers. Calyx lobes 4(-6), triangular. Petals generally absent. Stamens 2, 4, 8 or 11. Ovary sessile, incompletely 2-5-locular. Capsule small, circumscissile or dehiscing irregularly.

Ammannia baccifera L., Sp. Pl. ed. 2, 175. 1762; Gamble, Fl. Madras 510(360). 1919.

Leaves lanceolate-obovate, obtuse, cuneate-amplexicaul, to 3.5×1.4 cm. Cyme subsessile. Flowers dark red. Calyx without appendages. Petals 0. Stamens 4. Style thick. Capsule slightly longer than calyx, brownish-red; seeds minute, red.

Paleotropics. Frequent in marshes on the plain. December-April. *CJS* 12241, 12320.

LAGERSTROEMIA Linnaeus

Woody. Inflorescence a raceme or panicle; bracts 2, bracteoles 2, on the pedicel. Flowers usually 6-merous. Calyx lobes valvate. Petals clawed, wrinkled. Stamens many; filaments often unequal. Ovary globose or ellipsoid, sessile, 3-6-locular, with many axillary ovules. Capsule globose-ellipsoid, woody, loculicidally 3-6-valved; seeds many, elongate, falcately winged.

1 Calyx tube ribbed outside. Petals 2.5 cm or more long, purple.....*L. reginae*
1 Calyx tube smooth outside. Petals less than 1 cm long, white.
2 Leaves distinctly petioled. Inflorescence pubescent; calyx tube without any ring, 3 mm long (in fruit).....*L. microcarpa*
2 Leaves subsessile. Inflorescence glabrescent; calyx tube with a ring inside, 6-10 mm long (in fruit).....*L. parviflora*

Lagerstroemia microcarpa Wight, Ic. t. 109. 1839; Bedd., Fl. Sylv. t. 30. 1869; Furtado & Srisuko, Gard. Bull. Straits Settlem. 24: 192. 1969. *Lagerstroemia lanceolata* Wall. ex C. B. Clarke in J. Hooker, Fl. Brit. India 2: 576. 1879; Gamble, Fl. Madras 513(362). 1919. *Lagerstroemia thomsonii* Koehne in Engl., Pflanzenr. 17: 257. 1903; Gamble, Fl. Madras 513(362). 1919.

Large, deciduous trees. Petiole 0.5-1 cm long; blade elliptic-ovate, cuneate, usually hairy and glaucous beneath, to 10×6 cm. Calyx pink; tube smooth outside, without any ring, 2-3 mm long (in fruit); lobes caducous. Petals white. 4-6 stamens longer, others subequal. Capsule ellipsoid, 1 cm long, 3-4-valved, brownish-red.

South W. India. Frequent in upper Ghats and western plain. March-August. A timber tree. *CJS* 14330, 16796.

Lagerstroemia parviflora Roxb., Pl. Cor. t. 66. 1795; Wight, Ic. t. 69. 1840; Bedd., Fl. Sylv. t. 31. 1869; Gamble, Fl. Madras 512(362). 1919; Furtado & Srisuko, Gard. Bull. Straits Settlem. 24: 195. 1969.

Deciduous trees. Petiole short; blade elliptic-oblong, subrounded at base, to 6×3 cm, shining above, sometimes glaucous beneath. Inflorescence a panicle or axillary raceme. Calyx pink; tube smooth outside, with a ring inside, 6-10 mm long (in fruit); lobes generally persistent. Petals white. 4-6 stamens longer, others subequal. Capsule ovoid-oblong, 1.5-3 cm long, purple, 3-4-valved.

Western India, Western Ghats, Burma. Frequent across the western plain. February-August. A timber tree. *CJS* 14089, *HFP* 2803.

Lagerstroemia reginae Roxb., Pl. Cor. t. 65. 1795; Wight, Ic. t. 413. 1843; Bedd., Fl. Sylv. t. 29. 1869; Furtado & Srisuko, Gard. Bull. Straits Settlem. 24: 261. 1969. *Lagerstroemia flos-reginae* Retz., Obs. Bot. 5: 25. 1788, *pro parte*; Gamble, Fl. Madras 513(362). 1919.

Deciduous trees. Petiole 1 cm long; blade elliptic-oblong, rounded at base, to 15×8 cm, glabrous, thickly chartaceous. Pedicels articulate. Calyx tube ribbed outside, without any ring inside, 0.8 cm long (in fruit); lobes persistent. Petals purple. Stamens subequal. Capsule subglobose, apiculate, 6-valved, to 3×2.5 cm across; fruiting calyx lobes thickened at margins, spreading.

India, Burma, New Guinea. Usually cultivated ornamental trees; possibly wild along river banks in the Ghats. April-June. *CJS* 11673.

ROTALA Linnaeus

Herbs of wet places. Inflorescence of spikes or racemes; flowers sometimes solitary. Calyx often scarious or hyaline; lobes 3-6. Petals generally 3-6. Stamens 1-6. Ovary sessile or substipitate, glabrous, incompletely 2-4-locular. Capsule septicidally 2-4-valved; one of the valves crowned with persistent style.

1 Inflorescence terminal; leaves suborbicular; capsule 4-valved.....*R. rotundifolia*
1 Inflorescence or flowers axillary; leaves lanceolate; capsule 2-3-valved.
2 Leaves verticillate.....*R. verticillaris*
2 Leaves opposite, decussate.
3 Calyx lobes not alternating with appendages.....*R. indica*
3 Calyx lobes alternating with appendages.
4 Petals equaling calyx lobes; bracteoles shorter than calyx.....*R. leptopetala*
4 Petals twice as long as calyx lobes; bracteoles equaling calyx.....*R. densiflora*

Rotala densiflora (Roemer & Schultes) Koehne, Bot. Jahrb. 1: 164. 1880; Gamble Fl. Madras 508(359). 1919. *Ammannia densiflora* Roth ex Roemer & Schultes, Syst. 3: 304. 1818. *Rotala roxburghiana* Wight, Ic. t. 260B. 1840.

Leaves lanceolate. Flowers axillary, spicate; bracteoles equaling calyx. Calyx campanulate; lobes 5, triangular, alternating with appendages. Petals 5, pink, obovate, usually notched at apex. Stamens 5, equaling calyx lobes. Capsule 3-valved.

Indomalaysia. Frequent in wet places across the plain. November-March. *CJS* 15572, *HFP* 1258.

Rotala indica (Willd.) Koehne, Bot. Jahrb. 1: 172. 1880; Gamble, Fl. Madras 508(359). 1919. *Peplis indica* Willd., Sp. Pl. 2: 244. 1799. *Ameletia indica* DC., Prodr. 3: 76. 1828; Wight, Ic. t. 257A. 1840.

Leaves elliptic-lanceolate. Flowers axillary, spicate; bracteoles shorter than calyx. Calyx campanulate, without appendages; lobes 4, acuminate. Petals 4, obovate, pink, small. Stamens 4, included. Capsule 2-valved.

Indomalaysia. Collected once in flower from moist fields near Saklespur on December 20, 1968; expected in other similar places. *CJS* 12032B.

Rotala leptopetala (Blume) Koehne, Bot. Jahrb. 1: 162. 1880; Gamble, Fl. Madras 508(358). 1919. *Ammannia leptopetala* Blume, Mus. Bot. 2: 134. 1850.

Leaves linear-lanceolate. Flowers axillary, sessile; bracteoles shorter than calyx. Calyx lobes 5, short, acute, alternating with minute appendages. Petals 5, obscure. Stamens 5, exserted. Capsule usually 3-valved.

Indomalaysia. Collected only twice; probably common in moist places across the District. August-December. *CJS* 8963, 16050A.

Rotala rotundifolia (D. Don) Koehne, Bot. Jahrb. 1: 175. 1880;

Gamble, Fl. Madras 509(359). 1919. *Ammannia rotundifolia* Ham. ex D. Don, Prodr. Fl. Nepal. 220. 1825.

Stem terete. Leaves suborbicular. Inflorescence spicate, terminal. Bracteoles equaling calyx tube. Calyx campanulate, without appendages; lobes 4, triangular. Petals 4, obovate, larger than calyx lobes, purple. Stamens 4, shorter than calyx. Capsule 4-valved.

India, Indochina. Common in marshes across the District. January-April. *CJS* 11536, 16601.

Rotala verticillaris L., Mant. Alt. 175. 1771; Wight, Ic. t. 260A. 1840; Gamble, Fl. Madras 508(358). 1919.

Leaves 3-5 in a whorl, linear. Flowers axillary, verticillate; bracteoles obscure. Calyx tubular, exappendiculate; lobes 3, acuminate. Petals 3, red, small. Stamens 3, included. Capsule 3-valved.

Paleotropics. Collected once in flower and fruit near Arsikere on January 21, 1970. *CJS* 16070.

66. THYMELAEACEAE

C. J. Saldanha

GNIDIA Linnaeus

Large shrubs. Leaves alternate, estipulate, simple, entire, penninerved. Inflorescence terminal, a dense head, subtended by involucre of bracts. Flowers bisexual, regular. Calyx tubular, circumscissile above ovary, 5-lobed, imbricate; petals represented by 5 scales, inserted at throat of calyx tube and alternating with them, sometimes 0. Disc annular, sometimes 0. Stamens 10, in two rows, epipetalous. Ovary superior, 1-locular; ovule 1, pendulous; style lateral. Fruit indehiscent, small, 1-seeded, enclosed by base of persistent calyx tube.

Gnidia glauca (Fresen.) Gilg, Bot. Jahrb. Syst. 19: 265. 1894, in obs. *Lasiosiphon glaucus* Fresen., Flora 21: 603. 1838. *Gnidia eriocephala* Graham, Cat. Pl. Bombay 176. 1839; Meisner, Denkschr. Konigl.-Baier Bot. Ges. Regensburg 3: 292. 1841. *Lasiosiphon eriocephalus* (Graham) Descaisne in Jacquemont, Voy. Indes 4(3): 148. (?) 1844; Gamble, Fl. Madras 1244(871). 1925.

Leaves alternate, 4-7 × 0.8-1.4 cm, linear-oblong, abruptly acute, subcordate. Bracts silky. Calyx tube white-hairy, densely so at base; lobes 5, yellow. Disc annular. Ovary stalked, villous.

E. Africa, Peninsular India, Sri Lanka. Collected only once along outskirts of wet deciduous forest at Gendehalli bordering Chickmagalur District. January. *CJS* 12344.

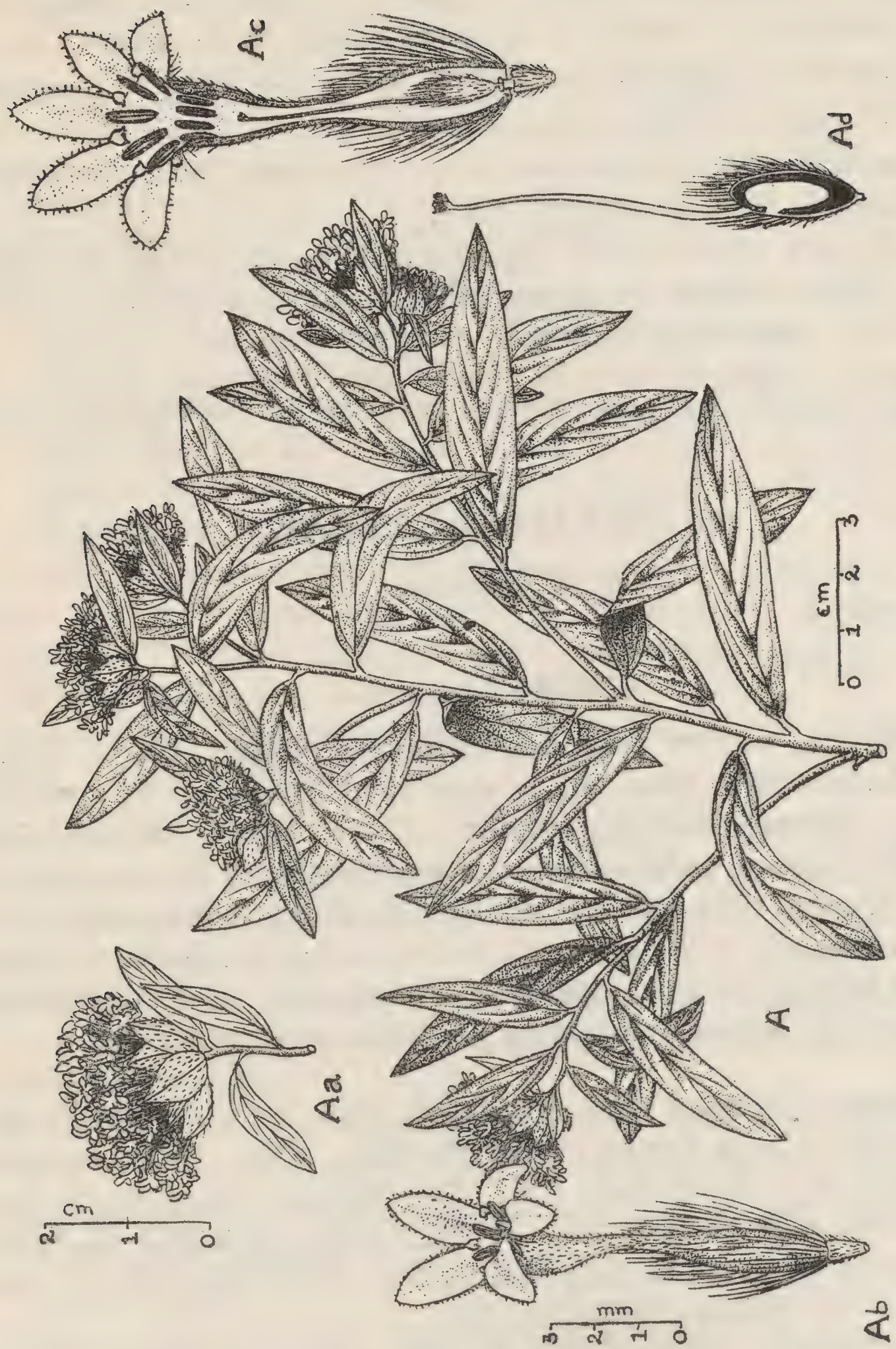


Fig. 51. THYMELAEACEAE. *A. Gnidia glauca*: habit; *Aa*, inflorescence; *Ab*, flower; *Ac*, same, vertical section; *Ad*, vertical section of ovary.

Note: Ding Hou (*Fl. Malesiana* ser. 1. 6(1): 4. 1960) mentions difficulties in generic delimitations within the family, a view shared by Dr. Peterson, who is working on African Thymelaeaceae. The latter, after extensive study of the African materials, feels that a few genera such as *Gnidia, Lasiosiphon, Arthrosolen* with a few more smaller genera should be merged into one, since the generic characters involved are the number of calyx lobes and the presence or absence of petaloid appendages, which he feels, are not enough to keep these separate. And in his monograph of *Gnidia,* he would be merging 7 genera.

We have followed Mr. C. Townsend (Kew) in reducing *L. eriocephalus* to *Gnidia glauca* (Fresen.) Gilg.

67. TRAPACEAE

K. N. Gandhi

TRAPA Linnaeus

Aquatic, floating herbs. Leaves dimorphic; submerged leaves opposite, pectinate; floating leaves, mostly rosulate, stipulate, with petiole inflated at or above the middle, simple; venation pinnate. Flowers solitary, axillary, bisexual, regular, peduncled. Calyx gamosepalous, accrescent, 4-lobed; 2 or all lobes becoming spiny in fruit. Petals 4, free, imbricate. Stamens 4, inserted around the cupular disc; filaments filiform; anthers 2-celled, dorsifixed. Ovary half-inferior, with a conical apex, 2-locular, with a pendulous ovule in each locule; style filiform; stigma capitate. Fruit a drupe with a short, cylindric beak, 4-angled (2 or 4 angles sharp-pronged), unilocular, 1-seeded.

Trapa natans L., Sp. Pl. 120. 1753.

var. **bispinosa** (Roxb.) Makino in Iinuma, Somoku-Dzusetsu ed. 3, 1: 137. 1907; Brenan, Fl. Trop. E. Africa (Trapac.) 3. 1953; Sant. & Wagh, Bull. Bot. Surv. India 5: 109. 1963. *Trapa bispinosa* Roxb., Pl. Cor. t. 234. 1815; Gamble, Fl. Madras 518(366). 1919.

Submerged leaves 3 cm long; floating leaves crenulate, ovate-rhomboid, subacute, broadly cuneate, 2.5×3 cm, tomentose beneath, glabrous above, subcoriaceous; petiole hairy. Flowers purple. Fruits 1 cm long, with 2 angles pronged.

India, Sri Lanka. Collected once in flower and fruit from a tank at Belur (plain) on January 22, 1970. *CJS* 16107.

68. MYRTACEAE

K. N. Gandhi

Shrubs or trees. Leaves mostly opposite; stipules 0; blade simple, entire, penninerved, often pellucid-dotted and with intra-marginal nerve.

Bracts and bracteoles deciduous. Flowers commonly bisexual, regular, 4-5-merous. Calyx usually with minute lobes or teeth. Petals usually free and imbricate. Stamens numerous, filaments usually free. Staminal disc often present. Ovary inferior, usually 2-5-locular, with many, axile or sometimes basal or parietal ovules. Fruit a berry, drupe or capsule, often crowned with persisting calyx limb, 1-many-seeded.

1 Calyx limb closed in bud, irregularly splitting into lobes at anthesis.....**Psidium**
1 Calyx lobes open in bud.
2 Calyx tube not produced beyond ovary.....**Eugenia**
2 Calyx tube produced beyond ovary.....**Syzygium**

EUGENIA Linnaeus

Flowers often solitary or fascicled. Calyx tube not produced beyond ovary; lobes longer than ovary, persistent. Petals ovate or obovate. Ovary 2-locular. Berry 1-2-seeded.

1 Flowers crowded; subsessile.....*E. codyensis*
1 Flowers 1-3, with pedicels more than 1.5 cm long.....*E. bracteata*

Eugenia bracteata (Willd.) Roxb., [Hort. Beng. 37. 1814, *nom.*] ex DC., Prodr. 3: 264. 1828; Gamble, Fl. Madras 484(342). 1919. *Myrtus bracteata* Willd., Sp. Pl. 2: 969. 1799.

Young parts ferruginous-tomentose. Leaves shortly petiolate, ovate-oblong, acuminate, rounded, glabrescent, to 7×2.5 cm, chartaceous. Flowers usually solitary; pedicel 2 cm long, bracteate at base; bracteoles 2, at the base of calyx and exceeding it. Corolla white. Disc present, not enlarged. Berries red.

East and South India, Sri Lanka. Occasional small trees amongst undergrowth of upper Ghats. December-May. *CJS* 15932, 16588.

Eugenia codyensis Munro ex Wight, Ill. 2: 13. 1841; Gamble, Fl. Madras 484(342). 1919.

Leaves elliptic-ovate, obtuse, cuneate, to 8×3.5 cm, subcoriaceous. Flowers fascicled, short-pedicelled. Calyx white-pubescent. Corolla white. Staminal disc slightly enlarged. Berry globose, 1 cm across.

Western Ghats. Occasional small trees in forest undergrowth of upper Ghats. February-May. *CJS* 16647, *HFP* 2596.

PSIDIUM Linnaeus

Enations pubescent. Cyme axillary, 1-3-flowered. Calyx tube not produced beyond ovary, with irregular lobes in flower, pubescent within. Staminal disc broad. Ovary 4-5-locular. Fruit a berry, globose; seeds numerous.

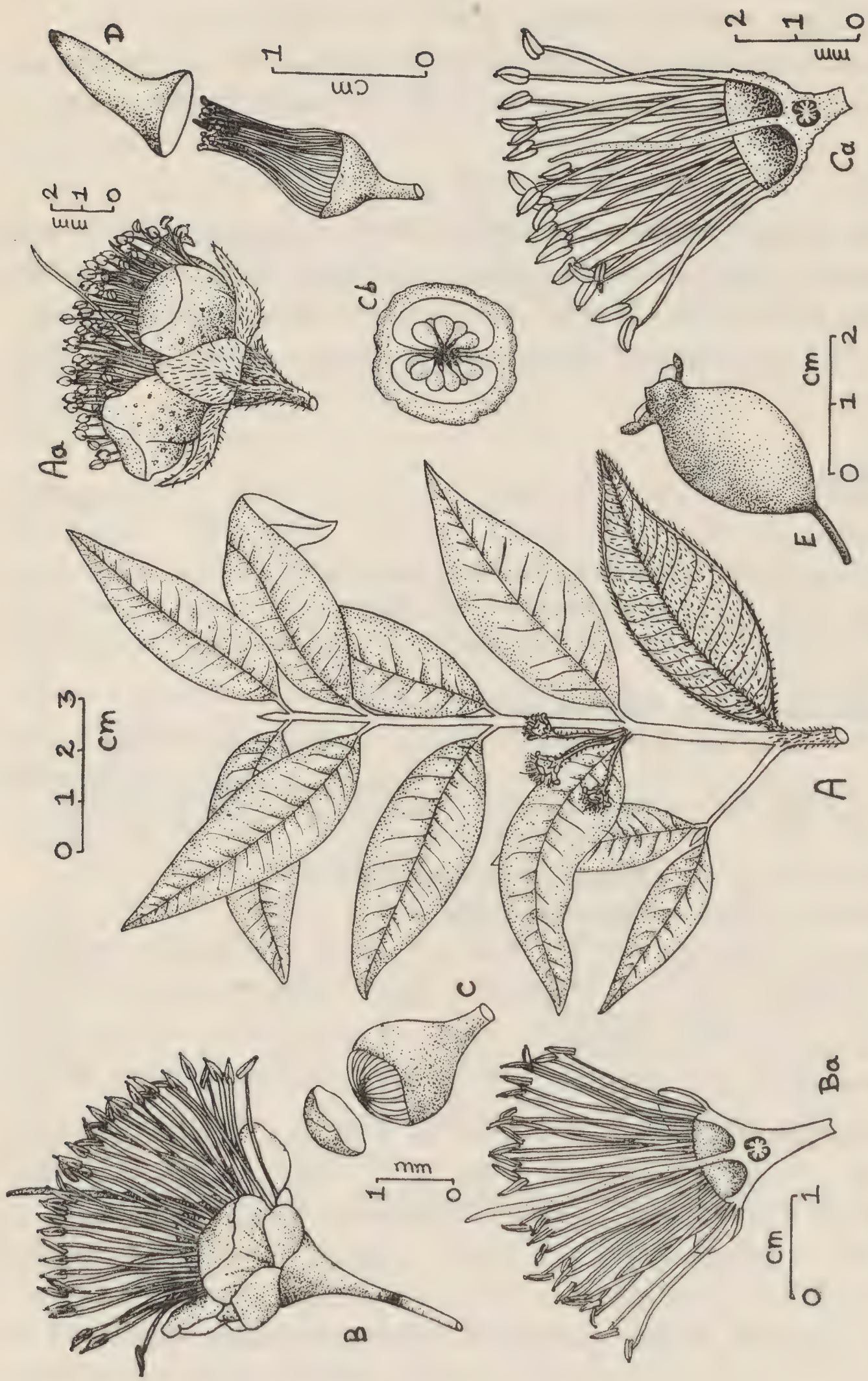


Fig. 52. MYRTACEAE. *A. Eugenia brasiliensis*: flowering twig; *Aa*, flower. *B. Syzygium jambos*: flower; *Ba*, section of same. *C. Syzygium heyneanum*: calyptrate flower-bud; *Ca*, section of flower; *Cb*, section of ovary. *D. Eucalyptus*: calyptrate flower-bud. *E. Syzygium laetum*: fruit.

Psidium guajava L., Sp. Pl. 470. 1753; Gamble, Fl. Madras 472(334). 1919.

Bark smooth, thin. Leaves short-petiolate, elliptic-ovate, acute, rounded at base. Peduncle to 1.6 cm long. Calyx tube to 0.8 cm long. Corolla white. Berry 4-10 cm across, yellow with age.

Introduced from S. America. Occasionally naturalized across the District. December-June. Cultivated for the edible fruits. *CJS* 11698, 15839.

SYZYGIUM Gaertner *nom. cons.*

Inflorescence a cyme, raceme or umbel, often panicled. Calyx tube produced beyond ovary, limb truncate to distinctly lobed. Petals free or connate into a calyptra. Ovary 2-4-locular. Berry 1-few-seeded.

1 Flowers large (hypanthium over 0.5 cm broad). Calyx limb distinctly lobed. Staminal disc thickened.
2 Stamens red.....*S. laetum*
2 Stamens white.
3 Leaves elliptic.....*S. hemisphericum*
3 Leaves lanceolate.
4 Calyx with long slender base; leaves narrowly lanceolate.....*S. occidentale*
4 Calyx with short narrowed base; leaves broadly lanceolate.....*S. jambos*
1 Flower small (hypanthium less than 0.5 cm broad). Calyx limb truncate or obscurely lobed. Staminal disc absent.
5 Calyx tube longer than broad, funnel-shaped. Petals free.
6 Calyx tube over 1 cm long; petals usually 12; leaves membranous; fruits red.....*S. lanceolatum*
6 Calyx tube less than 0.6 cm long; petals 4-5; leaves chartaceous; fruits white.....*S. zeylanicum*
5 Calyx tube broader than long, turbinate; petals calyptrate.
7 Petiole 0.5 cm long. Plants often near streams.
8 Inflorescence terminal; leaves broadly elliptic.....*S. caryophyllatum*
8 Inflorescence generally axillary. Leaves narrow, lanceolate.....*S. heyneanum*
7 Petiole 1-3 cm long. Plants of forests.
9 Inflorescence terminal, short, compact.....*S. gardneri*
9 Inflorescence axillary.....*S. cumini*

Syzygium caryophyllatum (L.) Alston in Trimen, Handb. Fl. Ceyl. 6: 116. 1931; Sant., Fl. Khandala ed. 3, 92. 1967. *Myrtus caryophyllata* L., Sp. Pl. 472. 1753. *Syzygium caryophyllaeum* auct. non Gaertner: Gamble, Fl. Madras 480(339). 1919. *Eugenia caryophyllaea* Wight, Ic. t. 540. 1842.

Small trees. Leaves short, petiolate, elliptic-obovate, subacute at both ends, 6-8×2.5-4 cm, coriaceous; venation distinct beneath. Cyme terminal, panicled, corymbose. Flowers in umbellules, small. Calyx 0.3 cm long, obscurely lobed. Corolla calyptrate, white. Staminal disc absent. Berry globose, purple, 0.5 cm across.

Western Ghats, Sri Lanka. Occasional in Ghats (often near streams). March-June. *HFP* 30, 2766.

Syzygium cumini (L.) Skeels, U.S.D.A. Bur. Pl. Industr. Bull. 248: 2. 1912; Sant., Fl. Khandala ed. 3, 92. 1967. *Myrtus cumini* L., Sp. Pl. 471. 1753. *Eugenia jambolana* Lam., Encycl. 3: 198. 1789; Wight, Ic. t. 535. 1842. *Syzygium jambolanum* (Lam.) DC., Prodr. 3: 259. 1828; Gamble, Fl. Madras 481(340). 1919.

Large trees. Petiole 1.5-2 cm long, slender; blade ovate-lanceolate, obtuse-acuminate, 10-14×3-6 cm, chartaceous; venation distinct beneath. Cyme panicled, usually axillary. Flowers in umbellules, small. Calyx 0.3 cm long, obscurely lobed. Corolla calyptrate, pink with yellow at throat. Staminal disc absent. Berry globose or oblong, purple.

Indomalaysia. Occasional in upper Ghats, also grown as avenue trees on plain. February-September. *CJS* 13126, *HFP* 2639.

Note : Fruits edible, sometimes used in religious ceremonies by Shaivite Hindus.

Syzygium gardneri Thwaites, Enum. 117. 1859; Gamble, Fl. Madras 479(339). 1918.

Large trees. Petiole 0.5-1 cm long, slender; blade elliptic-lanceolate, acuminate, subcuneate, 7-10×3-4 cm, chartaceous; venation distinct beneath. Cyme terminal, compact, corymbose, slender. Flowers small. Calyx 0.4 cm long, obscurely lobed. Corolla calyptrate, white. Staminal disc absent. Berry subglobose, purple.

Western Ghats, Sri Lanka. Occasional in lower Ghats. February-May. *CJS* 16410, *HFP* 2717.

Syzygium hemisphericum (Walp.) Alston in Trimen, Handb. Fl. Ceylon 6: 115. 1931. *Jambosa hemispherica* Walp., Rep. 2: 191. 1843; Gamble, Fl. Madras 474(335). 1919.

Large trees. Petiole 1-1.5 cm long; blade elliptic-lanceolate, subacuminate, cuneate, to 10-16×5-8 cm, coriaceous; venation distinct beneath, intramarginal vein obscure. Cyme terminal; branches trichotomously divaricate, few-many-flowered. Flowers large, articulate with the pedicel, white. Calyx tube funnel-shaped, 1 cm long, distinctly lobed. Petals free. Staminal disc thick, prominent. Berry hemispherical, purple, 2-2.5 cm across.

South India, Sri Lanka. Occasional across the District. January-July. *HFP* 1669, 2759.

Syzygium heyneanum (Duthie) Wall. ex Gamble, Fl. Madras 482(341). 1919. *Eugenia heyneana* Duthie in J. Hooker, Fl. Brit. Ind. 2: 500. 1879.

Shrubs or small trees. Leaves short-petiolate, oblong-oblanceolate, obtuse, 10×2.5 cm, subcoriaceous; venation distinct. Cyme panicled, usually extra-axillary, slender, shorter than leaves. Flowers in umbellules, small. Calyx 0.3 cm long, obscurely lobed. Corolla calyptrate, white. Staminal disc absent. Berry oblong, 1 cm long.

South W. India. Occasional in stream beds of lower Shiradi Ghat. February-May. *HFP* 1494, 1700.

Syzygium jambos (L.) Alston in Trimen, Handb. Fl. Ceylon 6: 115. 1931; Sant., Fl. Khandala ed. 3, 93. 1967. *Eugenia jambos* L., Sp. Pl. 470. 1753. *Jambosa vulgaris* DC., Prodr. 3: 286. 1828; Wight, Ic. t. 435. 1841; Gamble, Fl. Madras 474(336). 1919.

Medium trees. Leaves short-petiolate, ovate-lanceolate, acuminate, rounded-attenuate at base, 15-20×3-4 cm, subcoriaceous; venation barely distinct. Cyme terminal; branches trichotomously divaricate, short. Flowers fairly large, jointed with the pedicel. Calyx tube funnel-shaped, 1.2 cm long; limb distinctly lobed. Petals greenish-white. Staminal disc thick. Berry globose, 2.5-4 cm long, pinkish-white.

Indomalaysia. Occasional in plantations and along the roads in western plain and upper Ghats. October-January. *CJS* 12056, 12850.

Syzygium laetum (Ham.) Gandhi *comb. nov.* *Eugenia laeta* Ham., Mem. Wern. Nat. Hist. Soc. 5: 338. 1826. *Jambosa pauciflora* Wight, Ill. 2: 14. 1841. *Eugenia pauciflora* (Wight) Wight, Ic. t. 526. 1842. *Jambosa laeta* (Ham.) Blume, Mus. Bot. 1: 104. 1849; Gamble, Fl. Madras 474(335). 1919. *Eugenia laeta* var. *pauciflora* (Wight) Duthie in J. Hooker, Fl. Brit. India 2: 479. 1878.

Medium trees. Leaves shortly petiolate, elliptic-lanceolate, acuminate, cuneate, 7-10×3-4 cm, chartaceous. Peduncles usually 3-together, divaricate, terminal, slender, 2.5-3 cm long, 1-3-flowered, articulate with calyx. Flowers large. Calyx tube conical, 2 cm long, distinctly lobed. Petals white. Stamens red. Berry ovoid, 3×1.5 cm.

Western Ghats. Frequent in forest undergrowth of Ghats. December-April. *CJS* 12945, 15813.

Syzygium lanceolatum (Lam.) Wight & Arn., Prodr. 330. 1834. *Eugenia lanceolata* Lam., Encycl. 3: 200. 1789; Wight, Ic. t. 530. 1842. *Syzygium wightianum* Wall. ex Wight & Arn., Prodr. 330. 1834; Gamble, Fl. Madras 478(338). 1919.

Medium trees. Leaves short-petiolate, elliptic-lanceolate, subacute at both ends, 8×4 cm, chartaceous; venation distinct. Racemes sometimes umbellate, axillary and terminal, shorter than leaves. Flowers small. Calyx tube conical, 1-1.5 cm long, obscurely lobed. Petals usually 12, white. Berry scarlet, 1.3 cm long.

Western Ghats, Sri Lanka. Collected once in flower along stream bank at Vanagur (upper Bisle Ghat) on January 26, 1971. *HFP* 1312.

Syzygium occidentale (Bourd.) Gandhi *comb. nov.* *Eugenia occidentalis* Bourd., Indian Forester 30: 195, t. 3. 1904. *Jambosa occidentalis* (Bourd.) Gamble, Fl. Madras 474(336). 1919.

Small trees. Petiole 0.5-1 cm long; blade ovate-lanceolate, acuminate, attenuate at base, subcoriaceous, 16-20×3-3.5 cm; venation obscure. Cyme terminal; branches trichotomously divaricate. Flowers large, jointed with the pedicel. Calyx tube conical, to 2.5 cm long, distinctly lobed. Petals free, white. Berry globose, pale red, 2 cm across.

Western Ghats. Common along a stream at Kempuhole (lower Shiradi Ghat). February-May. *CJS* 11618, 13677.

Syzygium zeylanicum (L.) DC., Prodr. 3: 260. 1828; Wight, Ic. t. 73. 1838; Gamble, Fl. Madras 479(338). 1919. *Myrtus zeylanica* L., Sp. Pl. 472. 1753. *Eugenia spicata* Lam., Encycl. 3: 201. 1789; Bedd., Fl. Sylv. t. 202. 1872.

Medium trees. Petiole 0.5 cm long; blade elliptic-ovate, subacuminate, usually rounded at base, 5-8×2-3 cm, coriaceous; venation distinct. Cyme panicled, axillary and terminal, equaling or shorter than leaves. Flowers in umbellules, small. Calyx conical, 0.6 cm long. Petals free, white. Berry globose, 0.6 cm across, white.

Indomalaysia. Locally common in forest undergrowth of upper Ghats. March-July. *HFP* 1677, 1748.

* * *

Several species and hybrids of *Eucalyptus* are cultivated on the plain or upper Ghats. The Forest Department maintains a nursery at Vattehalla near Belur.

69. ONAGRACEAE

T. P. Ramamoorthy

LUDWIGIA Linnaeus

Herbs. Leaves alternate, simple, sometimes stipulate, entire, pinnately veined. Flowers ebracteate, bisexual. Calyx generally 4-5-lobed, valvate; petals 4-5. Stamens 4-5 or 8-10, free. Ovary inferior, 4-5-locular; ovules many, 1-many-seriate in each cell, axile; style simple; stigma capitate. Fruit mostly a septicidal capsule; seeds many.

1 Plants free-floating aquatics, with spongy floats.....*L. adscendens*
1 Plants without spongy floats.
2 Bracteoles large, mostly persistent, placed near the middle of ovary.....*L. octovalvis*
2 Bracteoles very small, deciduous early, near base of ovary.
3 Capsule short, less than 2 cm; impressions of seeds not visible without; seeds pluriseriate in each cell.....*L. perennis*
3 Capsule longer, more than 2.5 cm; impressions of seeds visible from without; seeds uniseriate in each cell.....*L. prostrata*

Fig. 53. ONAGRACEAE. *A. Ludwigia octovalvis* ssp. *sessiliflora*: flowering branch; *Aa*, flower; *Ab*, section of ovary; *Ac*, fruit, *Ad*, seed. *B. Ludwigia prostrata*: tetramerous flower; *Ba*, pentamerous flower; *Bb*, fruit; *Bc*, seed. *C. Ludwigia adscendens*: flowering branch; *Ca*, flower.

Ludwigia adscendens (L.) Hara, J. Jap. Bot. 28: 291. 1953. *Jussiaea repens* L., Sp. Pl. 388. 1753; Gamble, Fl. Madras 516(365). 1919 [non *Ludwigia repens* J. Forst. 1771]. *Jussiaea adscendens* L., Mant. 69. 1767.

Floating aquatics with spongy floats. Leaves with minute stipules at base, to 4.5×1 cm, oblong-lanceolate, rounded, cuneate. Flowers solitary, 5-merous; pedicel to 4 cm long, hairy above the middle; calyx lobes 0.9×0.2 cm, ovate, acuminate, hairy; petals white, yellow near base, obovate, 1×0.6 cm.

Pantropical. Fairly common in plains and upper Ghats, in open tanks. September. *CJS* 15027.

Ludwigia octovalvis (N. Jacq.) Raven, Kew Bull. 15: 476. 1962; Sant., Fl. Khandala ed. 3, 101. 1967. *Oenothera octovalvis* N. Jacq., Enum. Syst. Pl. 19. 1760.

ssp. **sessiliflora** (Micheli) Raven, Kew Bull. 15: 476. 1962. *Jussiaea octonervia* var. *sessiliflora* Micheli in Martius, Fl. Bras. 13: 180. 1875. *Jussiaea suffruticosa* L., Sp. Pl. 388. 1753; Gamble, Fl. Madras 516 (365). 1919.

Paludose herbs. Leaves to 7×1.5 cm, elliptic lanceolate, acute, cuneate, hairy, glabrescent with age. Flowers solitary, 4-merous. Calyx lobes ovate, acute, 1.1×0.4 cm, hairy; petals broadly obovate, 3×1.8 cm, glabrous; stamens 4-8. Ovary elongate, to 6 cm in fruit. Seeds not visible from without, globose.

Pantropical. Common in plains and upper Ghats along streams and in open marshes. August-January. *CJS* 10860, 15698.

Ludwigia perennis L., Sp. Pl. 119. 1753; Sant., Fl. Khandala ed. 3, 101. 1967. *Ludwigia parviflora* Roxb., Fl. Ind. 1: 419. 1820; Gamble, Fl. Madras 517(365). 1919.

Paludose herbs. Leaves 3-7.5×0.6-0.8 cm, linear-lanceolate. Flower solitary, 4-merous. Calyx lobes 0.3×0.1 cm, acute; petals yellow, 0.2-0.25 cm long. Stamens 4. Fruit 0.7-1 cm long, narrowed below; seeds pluriseriate, globose, not visible from without.

East Africa, Iran, Indomalaysia. Common in sandy river beds, near brooks and streams in plains and Ghats. November-April. *CJS* 9674, 15699.

Ludwigia prostrata Roxb., Fl. Ind. 1: 441. 1820; Wight, Ic. t. 762. 1844; Gamble, Fl. Madras 517(365). 1919.

Slender paludose herbs. Leaves 2-6×0.6-1.1 cm, ovate-lanceolate, subacuminate, cuneate. Flowers solitary, 4-5-merous. Calyx lobes 0.3×0.1 cm at anthesis, ovate, acute; petals yellow, broadly elliptic, acute at ends, 0.2 cm. Stamens 4-8. Fruit 1.5-2.2 cm long. Seeds uniseriate, visible from without, trigonous.

E. Asia, Indomalaysia. Common in Ghats, in moist soil or in sandy river beds. All seasons. *CJS* 13074, *HFP* 2491.

70. MELASTOMATACEAE

T. P. Ramamoorthy

Herbs, shrubs or small trees. Leaves opposite, estipulate, mostly entire and triplinerved. Flowers bisexual, regular. Calyx tube adnate to ovary at base, campanulate, 3-5-lobed, persistent. Petals free, 3-5, imbricate. Stamens twice or as many as petals, inserted on calyx tube; anther 2-celled, usually poricidal; connective usually produced and variously appendaged or tubercled. Ovary inferior or half-inferior, enclosed in calyx tube, (1-) 2-many-locular; ovules usually many, axile (free central); style terminal, elongate; stigma simple or lobed. Fruit a capsule, berry or indehiscent, 1-many-seeded.

1 Venation pinnate, indistinct; flowers blue; ovules few; ovary becoming 1-locular; anthers longitudinally dehiscent.....**Memecylon**
1 Venation palmate, distinct; flowers purple, pink or white, not blue; ovules many; ovary 2-many-locular; anthers poricidal.
2 Stem and branches scaly; stamens unequal.....**Melastoma**
2 Stem and branches hairy, hispid or glabrous; stamens all equal.
3 Flower 4-5-merous; anther connective produced, horned or tubercled below; inflorescence fasciculate.....**Osbeckia**
3 Flower 3-merous; anther connective not produced; inflorescence scorpioid.....**Sonerila**

MELASTOMA Linnaeus

Stem and branches scaly. Leaves 3-7-nerved from the base. Inflorescence of terminal fascicles, sometimes flower solitary. Flowers 5(-6-7)-merous. Calyx lobes alternating with as many denticles. Stamens 10, unequal, those alternating with petals large, connectives produced below and tubercled; those opposite to the petals small; connectives not produced. Ovary half-inferior, usually 5-locular. Fruit bursting irregularly, with numerous punctate seeds.

Melastoma malabathricum L., Sp. Pl. 390. 1753 ('*malabathrica*'); Gamble, Fl. Madras 495(350). 1919.

Shrub. Leaves 8-15 × 3.5-6 cm, elliptic-lanceolate, acute at both ends, triplinerved, scaly. Calyx lobes deciduous. Petals large, showy, broadly obovate, purplish. Larger stamens purple, smaller ones yellow.

India. Common in wet deciduous to semi-evergreen forests in Ghats, near brooks and streams. All seasons. *CJS* 16746, *HFP* 1604.

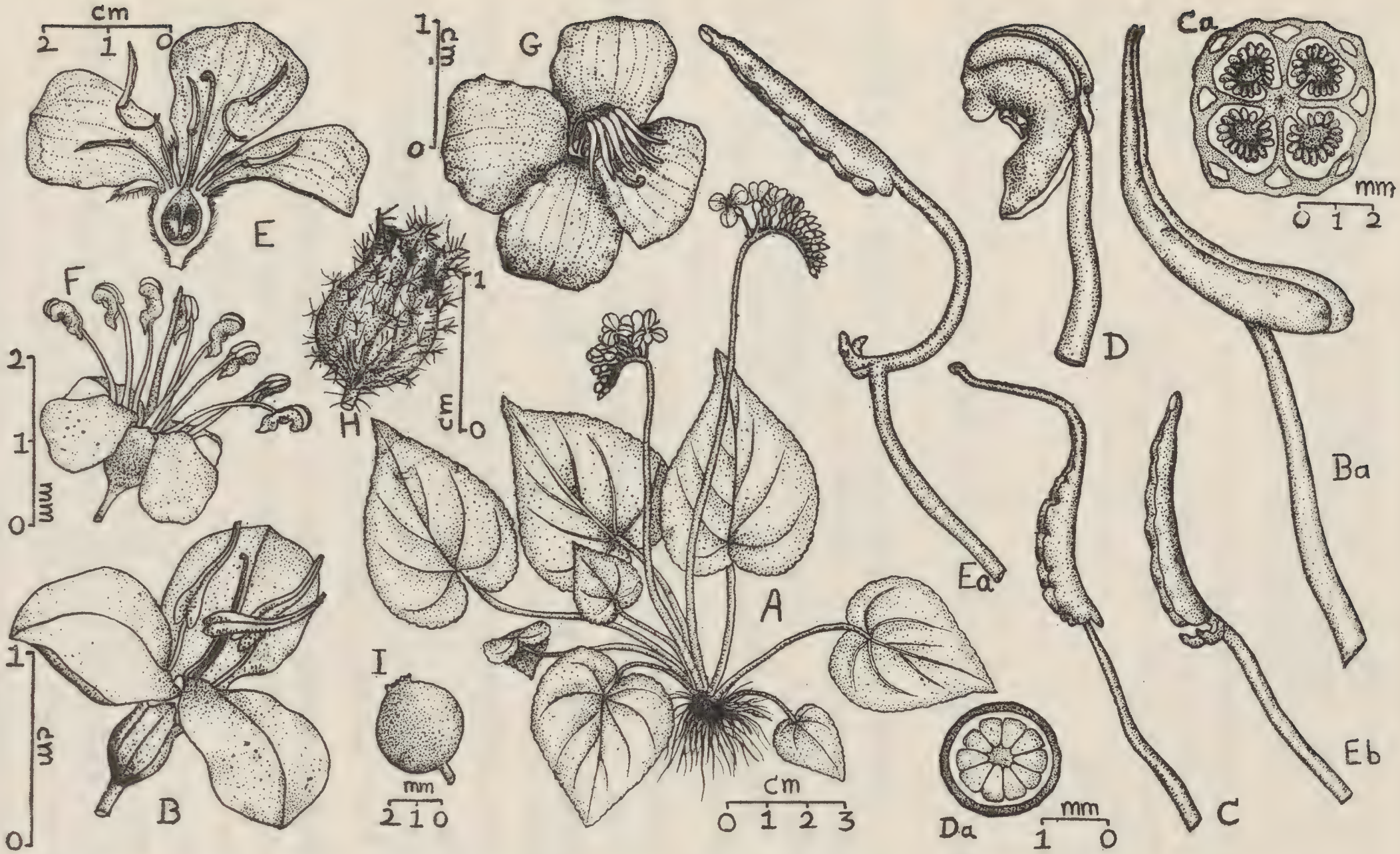


Fig. 54. MELASTOMATACEAE. *A. Sonerila wallichii*: plant in flower. *B. Sonerila rotundifolia*: flower; *Ba*, stamen. *C. Osbeckia hispidissima*: stamen; *Ca*, ovary, cross section. *D. Memecylon malabaricum*: stamen; *Da*, ovary, cross section. *E. Melastoma malabathricum*: flower, vertical section; *Ea* & *Eb*, stamens. *F. Memecylon angustifolium*: flower. *G. Osbeckia truncata*: flower, top view. *H. Osbeckia cupularis*: fruit. *I. Memecylon umbellatum*: fruit.

MEMECYLON Linnaeus

Leaves indistinctly pinnately veined. Inflorescence of axillary umbels, cymes or fascicles, ebracteate. Flowers 4-merous, blue. Calyx truncate or usually 4-toothed. Petals 4. Stamens 8; connective not produced but 2-horned below; anthers dehiscing by lateral slits. Ovary half-inferior, glabrous, becoming 1-locular by dissolution of septa; ovules 6-12, free-central. Berry globose, 1-seeded.

1 Flowers in peduncled cymes; leaves petiolate.
2 Leaves narrowly lanceolate; petals rounded ..... *M. angustifolium*
2 Leaves ovate, emarginate; petals acute ..... *M. umbellatum*
1 Flowers in sessile fascicles.
3 Leaves cordate, sessile ..... *M. malabaricum*
3 Leaves rounded, petiolate ..... *M. talbotianum*

Memecylon angustifolium Wight, Ic. t. 276. 1840; Gamble, Fl. Madras 504(355). 1919.

Trees to 5 m. Leaves narrowly lanceolate, cuneate, glaucous beneath. Cymes peduncled, on old wood. Petals rounded.

South W. India, Sri Lanka. Common in semi-evergreen forests in lower Shiradi Ghat, along wooded river bank (Kempuhole). April-May. *CJS* 13288, *HFP* 1695.

Memecylon malabaricum (C. B. Clarke) Cogn. in A. & C. DC., Monogr. Phan. 7: 1150. 1891; Gamble, Fl. Madras 505(356). 1919. *Memecylon amplexicaule* var. *malabaricum* C. B. Clarke in J. Hooker, Fl. Brit. India 2: 559. 1879 ('*malabarica*').

Trees to 16 m. Leaves very shortly petioled, 6-12×3.5 cm, ovate-oblong-lanceolate, cordate. Flowers in fascicles. Petals acute.

South W. India. Common in wet deciduous to semi-evergreen forests in the Ghats. May-August. *CJS* 13617, *HFP* 1736.

Memecylon talbotianum Brandis in Talbot, Bombay List. ed. 2, append. 1902; Gamble, Fl. Madras 503(355). 1919.

Trees reaching 10-15 m. Leaves shortly petioled, to 10×4.5 cm, elliptic, acute at both ends, drying yellow. Flowers fasciculate. Calyx campanulate, obscurely 4-lobed. Petals acute.

South W. India. Common in wet deciduous to semi-evergreen forests in Ghats. February-June. *CJS* 16233, *HFP* 2702.

Memecylon umbellatum N. Burman, Fl. Ind. 87. 1768; Sant., Fl. Khandala ed. 3, 95. 1967. *Memecylon edule* Roxb., Pl. Cor. t. 82. 1798; Gamble, Fl. Madras 504(356). 1919.

Trees to 15-18 m. Leaves petioled, to 10×4 cm, ovate, acute-acuminate, emarginate, cuneate. Inflorescence of peduncled cymes. Petals acute.

South W. India. Fairly common in wet deciduous to semi-evergreen forests in Ghats. April. *CJS* 13482, *HFP* 1555.

OSBECKIA Linnaeus

Annual or perennial herbs. Inflorescence of terminal fascicles, bracteate. Flowers 4-5-merous. Calyx usually bristly. Stamens 8-10, all equal; connectives not produced, appendiculate below. Ovary half-inferior, pilose at tip, 4-5-locular. Capsule apically 4-5-valved.

1 Flower 2 cm across; plant hispid.....*O. hispidissima*
1 Flower less than 2 cm across; plant hairy.
2 Stamens gradually attenuate towards tip.....*O. cupularis*
2 Stamens short, truncate.....*O. truncata*

Osbeckia cupularis D. Don ex Wight & Arn., Prodr. 322. 1834; Gamble, Fl. Madras 494(349). 1919. *Osbeckia leschenaultiana* Wight, Ic. t. 996. 1845, non DC. 1828.

Annuals, sometimes perennating. Leaves to 5×2 cm; ovate-elliptic, hairy. Flower 1.8 cm across. Calyx with stalked tufts of bristles all over back; lobes and denticles ending in tufts of bristles. Petals white. Anthers attenuate; connective not tubercled. Ovary hairy at tip. Capsule straw colored.

South W. India. Common in disturbed places in upper Ghats. September-March. *CJS* 15302, 15498, 17820.

Osbeckia hispidissima Wight, Ic. t. 1612. 1850; Gamble, Fl. Madras 493(349). 1919.

Hispid herbs. Leaves to 12×6 cm, 5-ribbed, broadly ovate, subcordate, hairy. Flower 3 cm across, 4-merous. Calyx tube bristly; lobes ovate, rounded, ciliate; petals broadly obovate, rose to purple. Anthers acuminate; connective with a pair of tubercles.

Peninsular India. Common in upper Ghats in open, wet grass lands, near streams, in and around marshes. February-July. *CJS* 12779, *HFP* 1882. (Plate 6).

Osbeckia truncata D. Don ex Wight & Arn., Prodr. 322. 1834; Wight, Ic. t. 375. 1840; Gamble, Fl. Madras 494(349). 1919.

Annual herbs to 15 cm. Leaves ovate, 3-ribbed, hairy. Flowers 4-merous. Petals mauve. Anthers short, truncate.

South W. India. Common on grassy hillsides in upper Ghats. October. *CJS* 15291, *HFP* 2301.

SONERILA Roxburgh *nom. cons.*

Caulescent or acaulescent herbs. Leaves crenate-serrate, palmately-

veined. Inflorescence a terminal, scorpioid cyme. Flowers 3-merous. Calyx campanulate. Stamens 3; anthers attenuate; connective not tubercled below. Ovary 3-locular. Capsule apically 3-valved.

1 Stem weak; leaves opposite.....*S. rheedii*
1 Stem none; leaves basal.
2 Leaves orbicular, rounded.....*S. rotundifolia*
2 Leaves ovate acute-acuminate.....*S. wallichii*

Sonerila rheedii Wight & Arn., Prodr. 321. 1834; Gamble, Fl. Madras 500(353). 1919.

Slender caulescent herbs with weak stems. Leaves to 7.5×4 cm, ovate, cordate, with white-based hairs. Flowers pink.

South W. India. Common in moist, shaded, well-drained places during monsoon. August-October. *CJS* 11247, 17804.

Sonerila rotundifolia Bedd., Madras J. Lit. Sci. ser. 2, 22: 74. 1861; Ic. t. 169, 1874; Gamble, Fl. Madras 501(353). 1919.

Scapigerous herbs. Leaf to 7×8 cm, to 9-nerved, round, orbicular, cordate with a wide sinus, sparsely hairy, often pink beneath. Flowers lilac.

Anamalais and Coorg in South W. India, now Hassan. Locally common in upper Bisle Ghat, in moist, shaded, well-drained places. August-September. *CJS* 17835, *HFP* 1994.

Sonerila wallichii Benn., Pl. Java. Rar. 215. 1844; Gamble, Fl. Madras 501(353). 1919.

Scapigerous herbs. Leaf to 15×7 cm, ovate, acute-acuminate, cordate, membranous, with white-based hairs. Flowers pink.

South W. India. Common in Ghats, in moist, shaded, well-drained places, in wet deciduous to semi-evergreen forests. August-September. *CJS* 17947, *HFP* 639.

71. COMBRETACEAE

K. N. Gandhi

Woody. Leaves alternate and/or opposite; stipules 0; blade simple, entire, often glandular near juncture with petiole; venation pinnate. Inflorescence spicate, racemose or capitate; bracts caducous. Flowers bisexual or polygamous, usually regular, with hypanthium beyond ovary. Calyx usually 4-5-lobed; limb usually deciduous. Petals 0 or 4-5, free, inserted near the mouth of hypanthium. Stamens usually 8-10; anthers versatile. Disc usually present, intrastaminal. Ovary inferior, 1-locular with 2-6 pendulous ovules; style subulate. Fruit usually angled or winged, sometimes crowned with persistent calyx, usually 1-seeded and indehiscent.

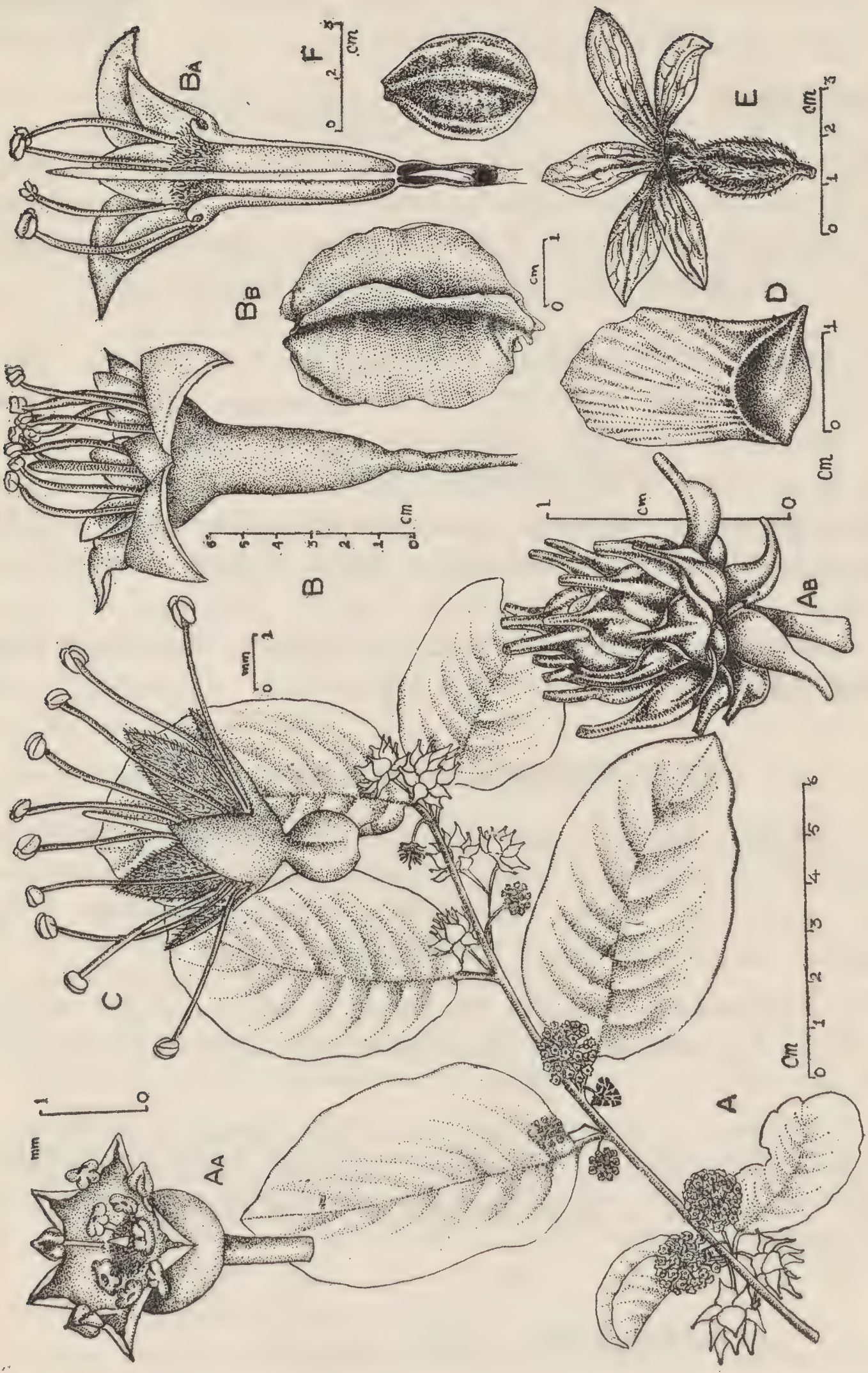


Fig. 55. COMBRETACEAE. *A. Anogeissus latifolia*: flowering and fruiting twig; *Aa*, flower; *Ab*, fruit. *B. Combretum latifolium*: flower; *Ba*, same, in section; *Bb*, fruit. *C. Terminalia bellirica*: flower. *D. Terminalia paniculata*: fruit. *E. Calycopteris floribunda*: fruit. *F. Terminalia chebula*: fruit.

1 Petals present..... **Combretum**
1 Petals absent.
2 Inflorescence capitate; fruit 2-winged..... **Anogeissus**
2 Inflorescence a spike or raceme; fruit not winged or 3- or 5-winged.
3 Climbers; fruit crowned by accrescent calyx; flowers racemose..... **Calycopteris**
3 Shrubs or trees; calyx deciduous; flowers spicate..... **Terminalia**

ANOGEISSUS (A. P. de Candolle) Guillemin & Perrottet

Leaves alternate. Inflorescence of globose heads. Flowers bisexual, 5-merous. Hypanthium long-attenuate beyond ovary; lobes deciduous. Petals 0. Stamens 10. Ovules 2. Fruits clustered in globose heads; each fruit 2-winged, compressed, crowned with persistent calyx tube.

Anogeissus latifolia (DC.) Wall. ex Bedd., Fl. Sylv. t. 15. 1869; Gamble, Fl. Madras 466(330). 1919. *Conocarpus latifolia* Roxb. ex DC., Prodr. 3: 17. 1828; Wight, Ic. t. 994. 1845.

Deciduous trees. Leaves elliptic-ovate, obtuse-acute, rounded-cordate, to 10×7 cm, glabrous. Heads solitary or in short cymes. Calyx yellow or pinkish-yellow; tube 3 mm long; lobes reflexed. Fruits 1 cm long.

India, Sri Lanka. Fairly common trees at Nagpuri, Byra (dry deciduous). August-January. *CJS* 15109, 17869.

CALYCOPTERIS Lamarck

Straggling shrubs. Leaves opposite. Inflorescence of subterminal simple or branching racemes. Calyx 5-angled; hypanthium not produced; lobes accrescent. Petals 0. Stamens 10. Ovules 3. Fruit ovoid, 5-angled, narrow, crowned by persistent calyx.

Calycopteris floribunda (Roxb.) Poiret in Lam., Encycl. Suppl. 2: 41. 1811; Gamble, Fl. Madras 467(331). 1919. *Getonia floribunda* Roxb., Pl. Cor. t. 87. 1798.

Young parts tomentose. Leaves ovate, acuminate, rounded at base, to 10×5 cm. Calyx white, showy. Fruit short, brownish, yellow-tomentose.

Indomalaysia. Common in undergrowth of lower Ghats. January-April. *CJS* 12843, 16363.

COMBRETUM Loefling *nom. cons.*

Leaves usually opposite, often with domatia beneath. Inflorescence spicate, simple or panicled. Flowers polygamodioecious. Calyx angled; hypanthium constricted above ovary; lobes 4-5, short, triangular, deciduous. Petals small, mostly 4-5. Stamens 8-10. Ovules 2-6. Fruit 4-5-angled or -winged.

Combretum latifolium Blume, Bijd. 641. 1825; Sant., Fl. Khandala ed. 3, 91. 1967. *Combretum extensum* Roxb. [Hort. Beng. 28. 1814, *nom.*] ex G. Don, Trans. Linn. Soc. London 15: 414, 422. 1827; Gamble, Fl. Madras 469(332). 1919.

Climber. Leaves elliptic-oblanceolate, to 15×6 cm, coriaceous, with irregular transverse nervules, subcoriaceous. Flowers bisexual, 4-merous, white, 1.5 cm long; bracteoles minute. Calyx funnel-shaped. Ovary 2-ovuled. Fruit ovoid, to 3×2 cm, with 4 membranous wings, tinged whit red.

Indomalaysia. Fairly common at outskirts of semi-evergreen forests of lower Shiradi Ghat. January-March. *CJS* 16209, 16374.

Note: One collection (*CJS* 13080) with pale green, chartaceous leaves and pale green fruits resembles *C. ovalifolium* Roxb. (*C. albidum* G. Don 1827?).

TERMINALIA Linnaeus

Trees. Leaves usually alternate, often punctate, usually with 2 glands on the petiole or near the base of midrib beneath. Inflorescence spicate, simple or branched. Flowers bisexual or polygamous. Calyx smooth, hypanthium not produced; limb campanulate, with short, triangular lobes. Petals 0. Stamens 10. Ovules 2(-3). Fruit dry or fleshy, angular, winged or entire.

1 Leaves clustered at ends of branchlets, eglandular; petiole 3-10 cm long; upper flowers often staminate..... *T. bellirica*
1 Leaves not clustered, frequently glandular on 1-2 cm petiole or at the base of midrib beneath; flowers bisexual.
2 Fruit almost entire; spike usually simple..... *T. chebula*
2 Fruit distinctly winged; spike branched.
3 Fruit unequally 3-winged, one wing larger..... *T. paniculata*
3 Fruit equally 5-winged.
4 Glands on lower leaf-midrib, stalked; calyx glabrous..... *T. crenulata*
4 Glands at leaf base, subsessile; calyx hairy..... *T. alata*

Terminalia alata Heyne ex Roth, Nov. Pl. Sp. 379. 1821; Rau, Bull. Bot. Surv. India 10 (Suppl. 2): 33. 1969. *Pentaptera tomentosa* Roxb. ex DC., Prodr. 3: 14. 1828. *Terminalia tomentosa* (DC.) Wight & Arn., Prodr. 314. 1834; Bedd., Fl. Sylv. t. 17. 1869; Gamble, Fl. Madras 465(329). 1919.

Leaves opposite, elliptic-lanceolate, acute, truncate-cordate, to 12×6 cm; glands at leaf base subsessile. Spike branched. Fruits elliptic, often apiculate, to 6×3.5 cm, glabrous; wings 5, equal, thick.

India. Collected once in fruit at Tagare (scrub) on January 16, 1969. *CJS* 12312.

Note: *Terminalia elliptica* Willd. (1805) has been referred to this taxon and, if correctly, would be the priorable name.

Terminalia bellirica (Gaertner) Roxb., Pl. Cor. t. 198. 1805 ('*bllerica*'); Gamble, Fl. Madras 463(328). 1919. *Myrobalanus bellirica* Gaertner, Fruct. 2: 90, t. 97. 1791 ('*bellirina*').

Leaves alternate, clustered towards ends of branchlets; petiole to 10 cm long; blade broadly obovate, cuneate, to 17×14 cm; glands 0. Spikes clustered towards apex, simple, to 25 cm long. Flowers creamy white. Fruit ovoid, slightly 5-ridged, brown-pubescent, to 2.5×1.5 cm.

Indomalaysia. Fairly common in deciduous forests, occasional in upper Ghats. February-August. *CJS* 13147, *HFP* 227.

Terminalia chebula (Gaertner) Retz., Obs. Bot. 5: 31. 1788; Gamble, Fl. Madras 464(328). 1919. *Myrobalanus chebula* Gaertner, Fruct. 2: 91, t. 97. 1791.

Young parts tomentose. Leaves alternate or subopposite; glands sessile, at apex of petiole; blade elliptic-oblong, rounded at both ends, to 10×7 cm. Spike short, usually simple. Flowers white or pale yellow. Fruit ovoid, almost entire, glabrous, to 3.5×2.5 cm, pale yellow.

India, Burma. Common in dry deciduous forests (Nagpuri). January-September. Fruits source of tannin. *CJS* 13437, 16709.

Terminalia crenulata Roth, Nov. Pl. Sp. 380. 1821; Gamble, Fl. Madras 465(329). 1919.

Leaves subopposite or alternate, crenulate or entire along the margin, elliptic-obovate, to 18×7 cm, with 2 stalked glands from lower midrib. Spike branched. Flowers pale yellow. Fruit 5-winged, to 3×3.5 cm, reddish.

India, Burma. Frequent in dry deciduous forests. April-August. *CJS* 10696, *HFP* 1631.

Terminalia paniculata Roth, Nov. Pl. Sp. 383. 1821; Gamble, Fl. Madras 465(329). 1919.

Young parts silky-pubescent. Leaves subopposite or upper ones alternate, oblong-lanceolate, shortly acuminate, rounded-cordate, to 14×5 cm, with sessile glands at base beneath. Spike branched. Flowers pale white. Fruit brownish-red, unequally 3-winged, middle wing larger, to 0.7×2 cm.

South W. India. Fairly common in dry deciduous forests and occasional in upper Ghats. June-September. *CJS* 14400, *HFP* 1849.

* * *

Quisqualis indica L. Ornamental scandent shrubs with opposite leaves and pendulous, elongate white flowers becoming dark red. Fruiting?

72. ELAEAGNACEAE

K. N. Gandhi

ELAEAGNUS Linnaeus

Erect or climbing shrubs, rarely trees, with numerous, peltate scales on branches, under surface of leaves and inflorescence. Leaves alternate; stipules 0; blade simple, entire; venation pinnate. Inflorescence axillary, racemose, fasciculate or of solitary flowers; bracts caducous. Flowers bisexual, regular. Perianth gamophyllous; lower tube constricted above the ovary and accrescent, upper longer, deciduous; lobes 4, valvate. Stamens 4, inserted at throat of perianth and alternate with its lobes; anthers exserted, medifixed. Ovary superior (appearing inferior in fruit), unilocular, with solitary, basal ovule; style erect; stigma simple. Fruit (anthocarp) an achene enclosed in fleshy perianth base and hence drupaceous.

Elaeagnus conferta Roxb., Fl. Ind. 1: 460. 1820; Gamble, Fl. Madras 1246(873). 1923. *Elaeagnus latifolia* L., Sp. Pl. 121. 1753, pro parte.

Unarmed, scandent shrubs, with silvery and rusty scales. Leaf blade elliptic-ovate, acute-acuminate, cuneate, to 6-9 × 3-4.5 cm, chartaceous, silvery below, dark green above. Flowers fasciculate. Pedicels 3-5 mm long. Perianth tube silvery, 1 cm long. Drupe red, 2-2.5 cm long; the putamen grooved.

Indomalaysia. Occasional in undergrowth of upper Ghats and western plains. November-March. *CJS* 15978, *HFP* 1231.

73. PROTEACEAE

T. P. Ramamoorthy

HELICIA Loureiro

Shrubs or trees. Leaves alternate, sometimes crowded in pseudo-whorls, estipulate, entire or crenate-serrate, pinnately veined. Inflorescence an axillary raceme (sometimes on old wood); bracts small, minute, usually deciduous. Pedicels geminate, free or connate. Flowers bisexual, regular. Tepals 4, free, erect, eventually revolute, alternating with 4 basal scales (petals ?). Stamens opposite and borne on tepals, sessile or shortly stalked; connective of anther usually produced. Ovary superior, sessile, 1-locular; ovules 1-2, basal; style thickened at tip. Drupe globose, 1-2-seeded.

Helicia nilagirica Bedd., Madras J. Lit. & Sci. ser. 3, 1: 56. 1864; Gamble, Fl. Madras 1243(870). 1923; Sleumer, Blumea 8: 69. 1955.

Fig. 56. PROTEACEAE. *A. Helicia nilagirica:* flowering branch; *B.* flower; *C.* ovary; *D.* same in section; *E.* fruit.

Trees to 8 m. Leaves 8-14×3.5-7.5 cm, oblanceolate, subacuminate, narrowed towards the thickened petiole, coarsely dentate, glabrous, coriaceous. Flower white. Drupe elliptic, fleshy, blue-black.

Nilgiris in South W. India. Locally common in the wet deciduous forests, along the banks of Jayaparvathi river near Devarunde. May-October. *CJS* 13718, 14025, *HFP* 2881.

* * *

Grevillea robusta A. Cunn. ex R. Br., the Australian silver oak, is cultivated in coffee and tea estates as a shade tree.

74. RHIZOPHORACEAE

T. P. Ramamoorthy

CARALLIA Roxburgh *nom. cons.*

Trees or shrubs. Leaves opposite with interpetiolar, deciduous stipules, simple, entire, pinnately veined. Inflorescence axillary, of peduncled cymes, sometimes flower solitary, bracteate. Flowers bisexual, regular, subtended by 2 deciduous and free or persistent and connate bracteoles. Calyx 5-8-lobed, usually persistent, lobes valvate; petals as many, alternating with sepals; disc annular, fleshy. Stamens twice as many as petals; filaments free, rarely connate. Ovary inferior, 3-8-locular; ovules 2 per locule, pendulous, axile; style thick-cylindrical; stigma 3-8-lobed. Fruit a drupe or berry, often 1-seeded.

Carallia brachiata (Lour.) Merrill, Philipp. J. Sci. Bot. 15: 249. 1919; Ding Hou in Steenis, Fl. Malesiana ser. 1, 5(4): 485. 1958. *Diatoma brachiata* Lour., Fl. Cochinch. 296. 1790. *Carallia integerrima* DC., Prodr. 3: 33. 1828; Bedd., Fl. Sylv. t. 193. 1872; Gamble, Fl. Madras 459(325). 1919.

Evergreen trees. Leaves coriaceous, 7-10×4-6.5 cm, entire, obovate, rounded-emarginate, sometimes apiculate, with many close parallel veins, glabrous, coriaceous. Flowers sessile. Calyx 8-lobed; petals orbicular, 2-fid, lacerate, clawed. Stamens 16; filaments fleshy, dilated toward base. Ovary 4-locular; stigma 4-fid. Berry 1-locular, 1-seeded.

Continental Asia to N. Australia. Common in wet deciduous and semi-evergreen forests in upper and middle Ghats. May-January. *CJS* 12226, 15973.

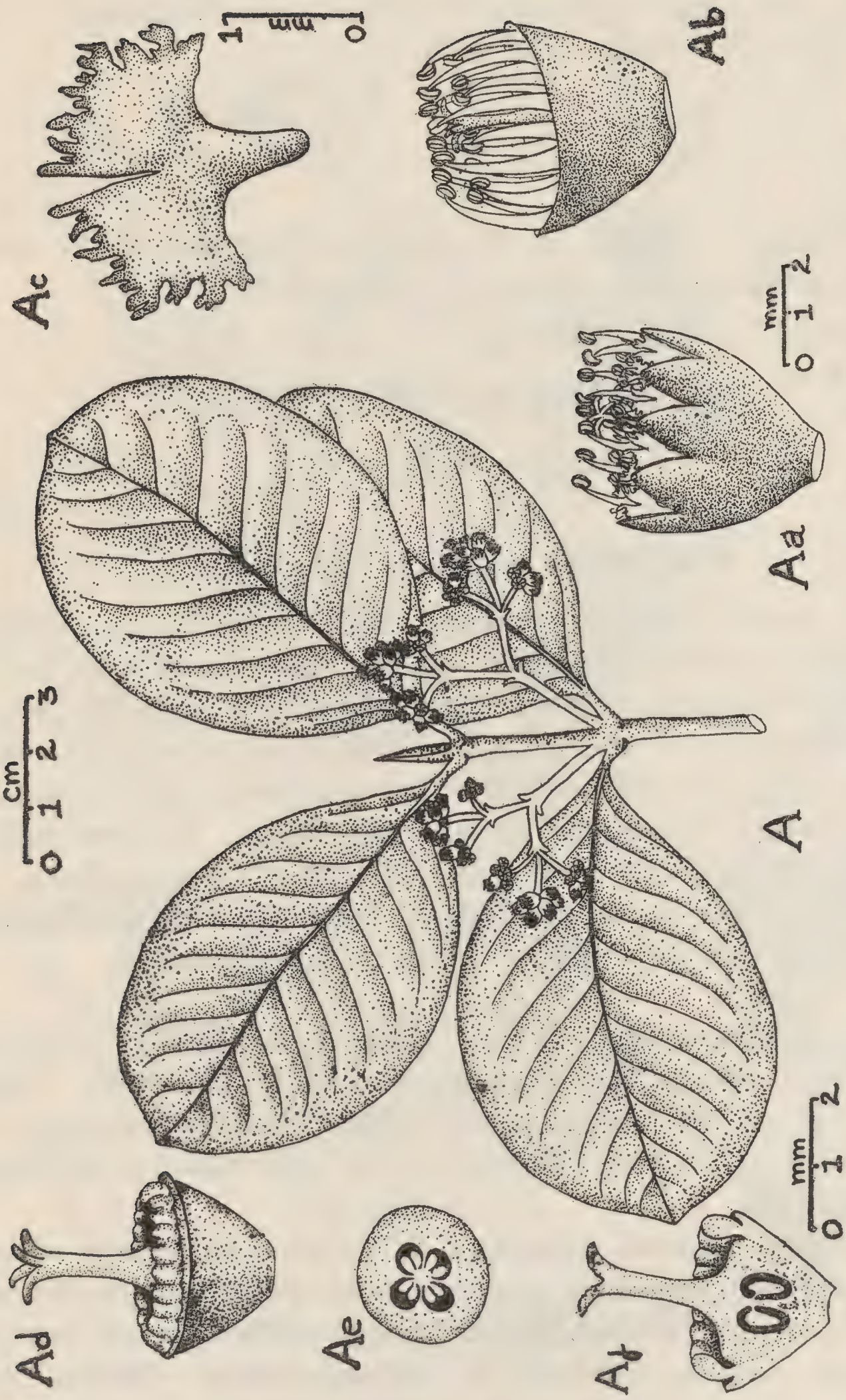


Fig. 57. RHIZOPHORACEAE. *A. Carallia brachiata*: flowering branch; *Aa*, flower; *Ab*, flower with sepals, petals removed; *Ac*, petal; *Ad*, pistil with disc; *Ae*, ovary, cross section; *Af*, same, vertical section.

75. CORNACEAE

T. P. Ramamoorthy

MASTIXIA Blume

Trees. Leaves alternate, estipulate, simple, entire, pinnately veined. Inflorescence terminal, of thyrsoid panicles, bracteate. Flowers bisexual, regular. Calyx 4-5-lobed; petals as many, free, usually inflexed at tip. Disc intrastaminal, 4-5-lobed. Stamens 4-5. Ovary inferior, 1-locular; ovule 1, pendulous; style short; stigma punctiform. Drupe ellipsoid, tipped by the persistent calyx and disc, grooved on one side; seed solitary, grooved.

Mastixia arborea (Wight) Bedd., Fl. Sylv. t. 216. 1872. *Bursinopetalum arboreum* Wight, Ic. t. 956. 1845.

ssp. **meziana** (Wangerin) Matthew (in press). *Mastixia meziana* Wangerin, Repert. Spec. Nov. Regni Veg. 4: 336. 1907; Gamble, Fl. Madras 573(405). 1919.

Trees to 18 m. Leaves 11-16 × 5-9 cm, broadly elliptic, abruptly acuminate at tip, narrowed below, pubescent, glabrous with age, drying pale beneath. Corymbs pubescent. Lower bracts larger, ovate, acuminate. Calyx 5-lobed. Petals white, turning blue with age, hairy externally, inflexed at tip. Anthers cordate below. Disc 5-lobed, yellow. Style short, cylindric; stigma entire. Drupe 3 × 2 cm.

Western Peninsular India. Occasional in Ghats, in wet deciduous and semi-evergreen forests, often along banks of rivers. March-May. *HFP* 106, 1475.

76. OLACACEAE

K. N. Gandhi

Erect or scandent shrubs or trees. Leaves usually alternate; stipules 0; blade simple, entire; venation usually pinnate. Bracts and bracteoles minute. Flowers usually bisexual and regular. Calyx gamosepalous, 4-5-toothed or -lobed. Petals (3-) 4-5, free, valvate. Stamens 1-2 times the number of petals and opposite to them, often alternating with staminodes. Disc various. Ovary superior or inferior, usually 1-locular, with 2-3 pendulous ovules; style simple. Fruit usually 1-seeded drupe with persistent calyx.

1 Leaves peltate with palmate venation; ovary inferior ..... **Erythropalum**
1 Leaves not peltate, with pinnate venation; ovary superior.
2 Stamens 8 or more; petals hairy within; plants usually armed ..... **Ximenia**
2 Stamens 3; petals glabrous; plants unarmed ..... **Olax**

Fig. 58. OLACACEAE. *A. Ximenia americana*: flowering twig; *Aa*, flower; *Ab*, fruit. *B. Olax wightiana*: flower; *Ba*, fruit. *C. Erythropalum populifolium*: flower.

ERYTHROPALUM Blume

Climbing shrubs, with deciduous, shortly bifid tendrils in upper axils. Venation palmate. Inflorescences cymose, axillary, lax. Calyx weakly 5-toothed, persistent. Petals 5. Stamens 5. Disc 5-lobed. Ovary inferior, immersed in disc. Stigma 3-lobed. Drupe oblong or obovoid, crowned with remains of calyx.

Erythropalum populifolium (Arn.) Masters in J. Hooker, Fl. Brit. India 2: 578. 1879; Gamble, Fl. Madras 191(137). 1915. *Mackaya populifolia* Arn., Mag. Zool. Bot. 2: 531. 1838.

Leaves peltate; petiole 3-4 cm long; blade ovate, acuminate, subcordate, glaucous beneath, membranous; venation distinct beneath, with 3 ascending and 2 basal veins. Flowers yellow, shorter than pedicels. Drupe red, 1.5 cm long.

Western Ghats. Occasional in forest undergrowth on upper Ghats. Flowering October-November, fruiting February-March. *CJS* 13039, 16224.

OLAX Linnaeus

Calyx cupular, truncate, accrescent. Petals usually 3, but appearing as 5-6, because all or 2 bifid. Stamens 3, and adnate to petals; staminodes usually 6, bifid. Ovary superior, incompletely 3-locular with 3 pendulous ovules. Stigma 3-lobed. Drupe subglobose, almost enclosed in calyx.

Olax wightiana Wall. [List 6779. 1832, *nom.*] ex Wight & Arn., Prodr. 89. 1834; Gamble, Fl. Madras 190(136). 1915.

Unarmed scandent shrubs or small trees. Leaves elliptic-oblong, subacute, rounded-cuneate, to 7×3.5 cm, glabrous, chartaceous, Inflorescence of short, clustered racemes or paniculate. Flowers white. Petals 3, usually 2 bifid. Drupe to 2 cm long, to 3/4 enclosed by calyx.

South W. India, Sri Lanka. Occasional in scrub in western plain; expected in Ghats. December-April. *CJS* 16319, *HFP* 2791.

XIMENIA Linnaeus

Inflorescence cymose, axillary and or terminal. Calyx lobes 4-5, persistent, valvate. Petals 4-5, oblong, hairy within. Stamens twice as many as petals; filaments short, inserted outside the disc; anthers linear. Ovary superior, sessile, incompletely 3-4-locular, each with 1 pendulous ovule; stigma subcapitate. Drupe ovoid-globose.

Ximenia americana L., Sp. Pl. 1193. 1753; Gamble, Fl. Madras 189 (135). 1915.

Shrubs or small trees; spines short. Leaves alternate on new shoots or fascicled on old shoots; blade elliptic-ovate, obtuse, rounded, glabrous, to 4×2.5 cm, coriaceous. Inflorescence axillary or terminating old shoots, short, few-flowered. Petals creamy white. Drupe to 3×2.5 cm, bright orange.

Tropics. Frequent in scrub across plain. June-July. *CJS* 14095, *HFP* 1513.

77. OPILIACEAE

T. P. Ramamoorthy

CANSJERA A. L. Jussieu *nom. cons.*

Scandent shrubs. Leaves alternate, estipulate, simple, entire, pinnately veined. Inflorescence axillary, of short spikes or fascicles. Flowers bisexual, regular, subtended by a small bract. Perianth tubular, 4-5-lobed, valvate. Stamens 4-5, opposite tepals; filament as long as perianth tube. Disc 4-5-lobed, lobes ovate-triangular, surrounding

ovary. Ovary superior, elongate, 1-locular; ovule 1, pendulous, indistinct; stigma 4-lobed. Fruit a drupe.

Cansjera rheedii Gmelin, Syst. 1: 280. 1791; Wight, Ic. t. 1861. 1852; Gamble, Fl. Madras 193(138). 1915.

Scandent shrub, young branches pubescent. Leaves 4-8×1.2-3 cm, ovate, acuminate, somewhat unequal. Spike pubescent. Perianth white, urceolate, pubescent without, lobes reflexed.

E. Asia to N. Australia. Occasional in the eastern plains, in open country, at Nuggehalli and Nagpuri. September. *CJS* 17905, *HFP* 607.

78. SANTALACEAE

K. N. Gandhi

Trees or shrubs, usually root parasites. Leaves usually alternate, simple, entire; stipules 0; venation pinnate, inconspicuous. Inflorescence various. Flowers bisexual or unisexual, regular. Perianth simple, 3-5-lobed, usually valvate. Stamens as many as tepals, inserted at the base of perianth, below the disc. Disc epi-hypogynous, cupular, often with 4-5 lobes alternating with perianth segments. Ovary usually inferior, 1-locular, with 2-3 ovules pendulous from a central column; style simple; stigma usually 2-4-lobed. Fruit usually a 1-seeded drupe.

1 Plants armed with spines. Staminal filaments 2-fid.....**Scleropyrum**
1 Plants unarmed. Staminal filaments entire.
2 Leaves alternate. Flowers unisexual. Perianth lobes 3-4.....**Osyris**
2 Leaves opposite. Flowers bisexual. Perianth lobes usually 4.....**Santalum**

OSYRIS Linnaeus

Glabrous shrubs. Flowers solitary or fascicled, subdioecious, pedicelled. Perianth segments 3(4), shorter than tube, tufted within. Stamens 3(-4). Disc shallow, angled.

Osyris quadripartita Salz. ex Decne., Ann. Sci. Nat. ser. 2, 6: 65. 1836; Hendrych in Tutin et al., Fl. Europaea 1: 70. 1964. *Osyris wightiana* Wall. [List 4036. 1828, *nom.*] ex Wight, Ic. t. 1853. 1852; Hara, Fl. East. Himal. 1: 63. 1966. *Osyris lanceolata* Hochst. & Steudel ex A. DC. in DC., Prodr. 14: 633. 1857, *nom. illeg.* *Osyris arborea* Wall. [List 4035. 1828, *nom.*] ex A. DC., *l.c.*; Gamble, Fl. Madras 1262(883). 1925.

Branches angled. Leaves elliptic-oblong, mucronate, cuneate, often glaucous, to 3.5×2 cm. Perianth yellow. Stigma 3-lobed. Drupes yellow-orange, 0.6-0.8 cm across.

Fig. 59. SANTALACEAE. *A. Santalum album*: flowering branch with leaves in pseudowhorls; *Aa*, flower; *Ab*, vertical section of same. *B. Osyris quadripartita*: flower. *C. Sclerophyrum wallichianum*: flower; *Ca*, fruit.

Continental Asia to Europe, through Africa. Fairly common in scrub across the plain. January-September. *CJS* 14076, 16890.

Note: The above nomenclature follows studies by Dr. Stauffer before his sudden death in 1966. He determined Asiatic collections (1964, at U. S.) as *O. lanceolata.* After surveying the European, Asiatic and African collections (at U. S.) we are inclined to agree with Dr. Stauffer. Unfortunately *O. lanceolata* is an illegitimate and superfluous renaming of *O. quadripartita* which is the oldest available name for this taxon.

SANTALUM Linnaeus

Leaves opposite. Inflorescence paniculate or racemose. Flowers bisexual. Perianth lobes 4(-5), valvate, slightly longer than tube, tufted within. Stamens 4(-5). Disc cupular, with 4(-5) lobes. Ovary initially almost free, ultimately adnate to perianth at base; stigma shortly 2-3-lobed.

Santalum album L., Sp. Pl. 349. 1753; Bedd., Fl. Sylv. t. 256. 1872; Gamble, Fl. Madras 1261(883). 1925.

Medium trees. Petiole 1-1.5 cm long; blade elliptic-ovate, acute, cuneate, to 8×3.5 cm, pale green beneath. Inflorescence shorter than leaves. Perianth purplish-brown inside. Drupe 1-1.5 cm across.

South India. Fairly common trees in dry deciduous forests across the plain. June-February. *HFP* 232, 2106.

Note: The strongly scented heartwood has great commercial value: used in carvings, distillation of oil, in religious ceremonies of Hindus, etc.

SCLEROPYRUM Arnott

Inflorescence spicate, 1-3-fascicled in leafless axils. Flowers subdioecious. Perianth lobes 5, tufted within. Stamens 4-5; filaments bifid at apex, each arm bearing an anther cell; anthers dehiscing transversely. Disc cupular, undulate.

Scleropyrum wallichianum (Wight & Arn.) Arn., Mag. Zool Bot. 2: 550. 1838; Wight, Ic. t. 241. 1839; Gamble, Fl. Madras 1262(884). 1925. *Sphaerocarya wallichiana* Wight & Arn., Edinburgh New Philos. J. 15: 180. 1833.

Small trees; spines short. Petiole 0.6 cm; blade elliptic-lanceolate, subacute, rounded at base, to 12×4.5 cm, glabrous. Inflorescence minutely pubescent. Perianth red. Drupes pyriform, 3 cm long, red.

South W. India, Sri Lanka. Occasional in upper Ghats. October-May. *CJS* 15693, *HFP* 1732.

79. LORANTHACEAE

T. P. Ramamoorthy

Evergreen stem-parasitic shrubs, attached to their hosts by haustoria; dichotomously branching with swollen and jointed nodes. Leaves usually opposite, estipulate, simple, entire, sometimes reduced to scales or none, usually pinnately veined. Inflorescence axillary, various, mostly bracteate. Flowers usually bisexual, regular or irregular, with 1-3 bracts. Calyx usually reduced to a rim or 0. Petals 4-6, usually connate into a tube. Stamens as many as petals, epipetalous, opposite to lobes. Ovary inferior, 1-locular; ovule 1, indistinct; style 1; stigma usually capitate. Fruit a 1-seeded, indehiscent berry or drupe.

1 Flower unisexual; leaves none, when present without midrib.....**Viscum**
1 Flower bisexual; leaves well developed, with midrib.
2 Bracts large, forming an involucre enclosing inflorescence.....**Tolypanthus**
2 Bracts small, not involucrate.
3 Flower subtended by 2-3 bracts.....**Macrosolen**
3 Flower subtended by single bract.
4 Petals free.....**Helixanthera**
4 Petals fused.
5 Flower regular; corolla tube not split on one side.....**Dendrophthoe**
5 Flower irregular; corolla tube split half-way on one side.
6 Flower 4(-5)-merous; calyx tube attenuate towards base; leaves opposite.....**Scurrula**
6 Flowers 5(-4)-merous; calyx tube not attenuate towards base; leaves alternate.....**Taxillus**

DENDROPHTHOE Martius

Inflorescence an axillary, sometimes terminal raceme or spike. Flower regular, subtended by one bract. Corolla 5-lobed; tube somewhat dilated; bud clavate; lobes reflexed from the narrowed point. Staminal filaments coherent to the corolla, later free. Fruit ovoid.

1 Stem trigonous; leaves whorled; bract cupular.....*D. trigona*
1 Stem terete; leaves opposite; bract lateral.....*D. falcata*

Dendrophthoe falcata (L. f.) Etting., Denkschr. Kaiserl. Akad. Wiss., Math. Naturwiss. Kl. 32: 52-53, 58, t. 13, f. 14. 1872; Sant., Fl. Khandala ed. 3, 234. 1967; Wiens in Abeywick., Fl. Ceylon 1: 68. 1973. *Loranthus falcatus* L. f., Suppl. 211. 1781. *Loranthus amplexifolia* DC., Prodr. 4: 306. 1830. *Loranthus longiflorus* var. *falcatus* (L. f.) Kurz, For. Fl. 2: 321. 1877; Gamble, Fl. Madras 1253(877). 1925. *Loranthus longiflorus* var. *amplexifolia* (DC.) Thwaites, Enum. 134. 1859; Gamble, Fl. Madras 1253(877). 1925.

Stem terete. Leaves 7-16×1-8 cm, ovate to lanceolate, acute,

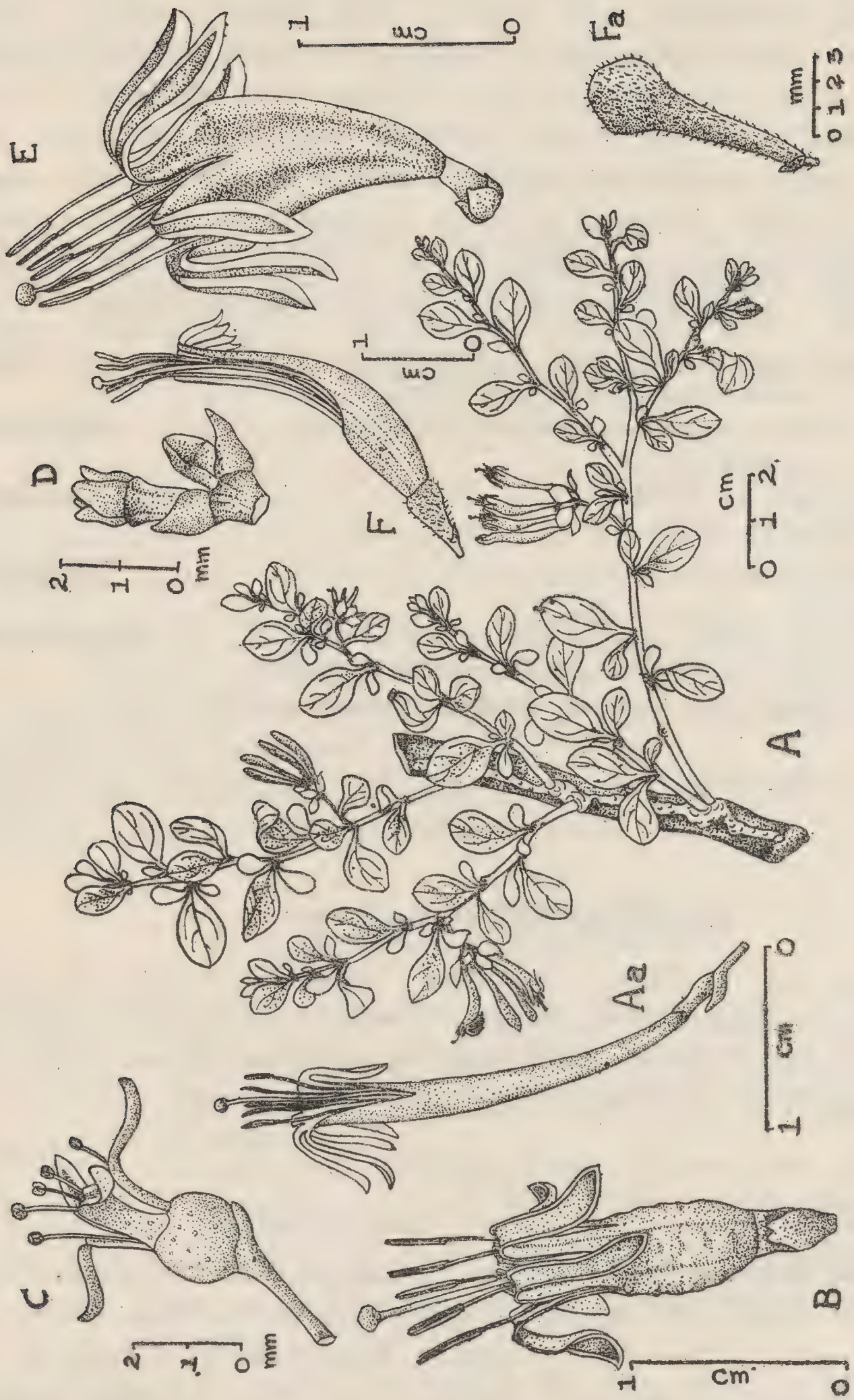


Fig. 60. LORANTHACEAE. *A. Taxillus bracteatus*: plant in flower; *Aa*, flower. *B. Dendrophthoe trigona*: flower. *C. Helixanthera wallichiana*: flower. *D. Viscum monoicum*: staminate flower. *E. Macrosolen parasiticus*: flower. *F. Scurrula cordifolia*: flower; *Fa*, fruit.

cordate-amplexicaul to cuneate at base. Corolla tube to 5 cm long, green, sometimes red.

Indomalaysia. Common in plains and Ghats, parasitic on *Terminalia* spp., *Butea monosperma, Bauhinia* spp. All seasons. *CJS* 14295, 14318, *HFP* 1588.

Note: The plants with amplexicaul leaf bases have often been accorded a distinct specific or varietal status. Wiens does not consider this as sufficient reason to keep the plants separate from *D. falcata.* *CJS* 10902, 11217, 11736, 12451, 12481, 12515, 12785, 14295 have amplexicaul leaf bases.

Dendrophthoe trigona (Wight & Arn.) Danser ex Sant., Rec. Bot. Surv. India 16(1): 163. 1953; Fl. Khandala ed. 3, 235. 1967. *Loranthus trigonus* Wight & Arn., Prodr. 386. 1834; Gamble, Fl. Madras 1253(877). 1925.

Stem trigonous. Leaves shortly petioled, to 12×8.5 cm, broadly obovoid. Corolla tube brown, 0.6 cm-0.8 cm long.

South W. India. Fairly common in Upper Bisle Ghat, and eastern plains, on *Ficus* spp., *Memecylon* spp. October-March. *CJS* 15237, *HFP* 2306.

HELIXANTHERA Loureiro

Leaves sometimes alternate. Inflorescence of axillary racemes. Flowers regular, subtended by a single bract. Petals mostly 4, free or divided to near their base. Fruit round.

1 Petals more than 1 cm long.....*H. intermedia*
1 Petals less than 0.5 cm long.....*H. wallichiana*

Helixanthera intermedia (J. Hooker) Danser, Bull. Jard. Bot. Buitenzorg ser. 3, 10: 317. 1929. *Loranthus intermedius* Wight ex J. Hooker, Fl. Brit. India 5: 205. 1886; Gamble, Fl. Madras 1251(876). 1925.

Leaves shortly petioled, 9-16×4-8 cm, elliptic, narrowed at both ends. Petals 4, 1-1.5 cm, linear, spatulate, free to base, pink.

South W. India. Common in upper Ghats and western plains, parasitic on *Cedrella toona, Mangifera indica.* April-June. *CJS* 11660, 13349, *HFP* 2879.

Helixanthera wallichiana (Schultes) Danser, Bull. Jard. Bot. Buitenzorg ser. 3, 10: 317. 1929. *Loranthus wallichianus* Schultes, Syst. 7: 100. 1820; Wight, Ic. t. 143. 1839; Gamble, Fl. Madras 1251(876). 1925. *Loranthus polystachyus* Wall. in Roxb., Fl. Ind. 2: 217. 1824, non Ruiz & Pavon 1802.

Leaves sessile, to 12×6 cm, ovate, elliptic, acute at both ends. Petals 4, free to base, 0.25 cm long, scarlet.

South W. India. Common in western plains and western Ghats, parasitic on *Memecylon* spp., *Ardisia solanacea, Bridelia crenulata.* April-July. *CJS* 11711, 16858, *HFP* 1641.

MACROSOLEN (Blume) Reichenbach

Usually petioled. Inflorescence of axillary racemes, spikes or umbels. Flower regular, subtended by 2-3 bracts. Corolla mostly 6-lobed; lobes revolute. Fruit globose.

1 Corolla less than 2.5 cm long.....*M. capitellatus*
1 Corolla more than 3.5 cm long.....*M. parasiticus*

Macrosolen capitellatus (Wight & Arn.) Danser, Blumea 4: 36. 1936; Wiens in Abeywick., Fl. Ceylon 1: 64. 1973. *Loranthus capitellatus* Wight & Arn., Prodr. 382. 1834. *Elytranthe capitellata* (Wight & Arn.) Engl. in Engl. & Prantl, Pflanzenfam. 3(1): 189. 1889; Gamble, Fl. Madras 1255(879). 1925.

Leaves 4-8×2.5-4 cm, ovate, acute to shortly acuminate. Corolla to 2.5 cm long, usually red, with green limb; lobes spatulate, reflexed.

South W. India, Sri Lanka. Common in upper Ghats and western plains, parasitic on *Ficus, Artocarpus* spp., *Pterocarpus marsupium.* March-June. *CJS* 13125, 16696, *HFP* 178.

Note: There has been some doubt about the distinctiveness of this species from the following one. Gamble (*l. c.*) Danser (*l. c.*) and Wiens (*l. c.*) treat them as separate species. Thwaites and others have questioned this view.

Macrosolen parasiticus (L.) Danser, Blumea 4: 36. 1936. *Lonicera parasitica* L., Sp. Pl. 175. 1753. *Loranthus loniceroides* L., Sp. Pl. ed. 2, 473. 1762. *Elytranthe loniceroides* (L.) G. Don, Gen. Syst. 3: 427. 1834; Gamble, Fl. Madras 1255(879). 1925.

Leaves 5-10×2.5-5 cm, ovate, acuminate. Corolla ± 5 cm long, red, green at tip; lobes reflexed.

South W. India, Sri Lanka. Common in Ghats, occasional in plains; parasitic on *Ficus* spp., *Mangifera indica.* May-August. *CJS* 10676, 15154, 14461.

SCURRULA Linnaeus

Leaves glabrous with age. Inflorescence of axillary, simple racemes. Flowers irregular, subtended by single bract. Corolla 4-5-lobed; lobes reflexed. Style not articulated. Fruit clavate.

1 Petals more than 1.5 cm long.....*S. cordifolia*
1 Petals less than 1.5 cm long.....*S. parasitica*

Scurrula cordifolia (Wall.) G. Don, Gen. Syst. 3: 423. 1834. *Loranthus cordifolius* Wall. in Roxb., Fl. Ind. 2: 222. 1824; Gamble, Fl. Madras 1252(876). 1925.

Petiole to 2 cm long; leaf blade 9-11×5-7 cm; elliptic, rounded at both ends, sometimes cordate below, white-pubescent beneath. Racemes mostly in axils of fallen leaves. Corolla red, 4-lobed.

Nepal, India, Sri Lanka. Occasional in plains, usually on *Butea monosperma*. July-October. *CJS* 14016, *HFP* 2243.

Scurrula parasitica L., Sp. Pl. 110. 1753; Wiens in Abeywick., Fl. Ceylon 1: 73. 1973. *Loranthus buddlejoides* Desv. in Lam., Encycl. 3: 600. 1792; Gamble, Fl. Madras 1251(876). 1925 ('*buddleioides*').

Petiole to 1 cm, leaf blade to 5×3 cm, elliptic-oblanceolate, rounded at tip, rufous-tomentose beneath. Racemes axillary. Corolla 5-lobed, red.

S. Asia, Indomalaysia. Fairly common in plains and upper Ghats, on *Dalbergia* spp. October-March. *CJS* 12003, *HFP* 1500.

TAXILLUS Van Tieghem

Leaves alternate, sometimes fascicled. Inflorescence axillary, a few-flowered umbel. Flower irregular, subtended by a single bract. Corolla 5-4-lobed; tube rather elongate; lobes reflexed. Style not articulated. Fruit globose.

1 Bract longer than calyx..... *T. bracteatus*
1 Bract shorter than calyx.
2 Corolla tube floccose-woolly..... *T. tomentosus*
2 Corolla tube glabrous..... *T. cuneatus*

Taxillus bracteatus (Wall.) Van Tiegh., Bull. Soc. Bot. France 42: 256. 1895. *Loranthus bracteatus* Heyne ex Wall. in Roxb., Fl. Ind. 2: 220. 1824; Gamble, Fl. Madras 1252(876). 1929; *Taxillus tomentosus* auct. non Van Tiegh.: Wight & Arn., Prod. 385. 1834; Wight, Ic. t. 378. 1840.

Leaves subsessile, to 1.8×0.8 cm, obovate, hairy. Bracts ovate, larger than calyx. Corolla white-tomentose.

South W. India. Common in eastern plains, usually on *Terminalia* spp. March-July. *CJS* 13965, *HFP* 1503.

Taxillus cuneatus (Roth) Danser, Bull. Jard. Bot. Buitenzorg ser. 3, 10: 354. 1929; Sant., Fl. Khandala ed. 3, 237. 1967. *Loranthus cuneatus* Heyne ex Roth, Nov. Pl. Sp. 193. 1821; Gamble, Fl. Madras 1253(877). 1929.

Leaves sessile, obovate, cuneate, rounded at tip. Bract smaller than calyx tube. Corolla red, tube to 2 cm long.

South W. India, Sri Lanka. Occasional in Ghats, found on *Aporosa lindleyana.* April-May. *CJS* 13585, *HFP* 2749.

Taxillus tomentosus (Roth) Van Tieghem, Bull. Soc. Bot. France 42: 256. 1895. *Loranthus tomentosus* Roth, Nov. Pl. Sp. 191. 1821; Gamble, Fl. Madras 1252(876). 1925.

Leaves sessile, to 5×2.5 cm, obovate-oblanceolate, rusty-villous below, drying black above. Bract shorter than calyx. Corolla tube to 1 cm long, rusty-villous.

South W. India. Common in upper Ghats. November-May. *CJS* 13727, 15593.

Note: May include *Loranthus gibbosus* Gamble [*Dendrophthoe gibbosa* (Gamble) Razi]. Plants with bracts shorter than calyx have recently been renamed *T. incanus* (Trimen) Wiens (*Fl. Ceylon* 1: 71. 1973). However this character does not appear to be sufficient to maintain a species distinct from *T. tomentosus.* Our specimens have bracts shorter than calyx.

TOLYPANTHUS Blume

Leaves shortly petioled. Inflorescence often on old wood, of fascicles subtended by a large, foliaceous involucral bract. Flower regular. Corolla 5-lobed. Fruit ovate.

Tolypanthus lagenifer (Wight) Van Tieghem, Bull. Soc. Bot. France 42: 249. 1895; Danser, Bull. Jard. Bot. Buitenzorg ser. 3, 10: 355. 1929. *Loranthus lageniferus* Wight, Ic. t. 306. 1840; Gamble, Fl. Madras 1254(878). 1925.

Leaves to 8×5.6 cm, broadly elliptic, acute, subcordate, sometimes orbicular. Involucral bract large, cupular, to 2×3 cm, bright red. Corolla red.

South W. India. Common in Ghats, found on *Derris indica, Hopea wightiana.* June-October. *CJS* 14161, *HFP* 1911.

VISCUM Linnaeus

Leaves sometimes reduced to scales or none. Inflorescence axillary, usually in sessile fascicles. Flowers unisexual. Tepals 4, fused. Male: perianth tube short; lobes bearing anthers; anthers usually many-celled, dehiscing by pores. Female: perianth lobes deciduous after anthesis; style conical or mamilliform.

1 Leaves well developed.
2 Leaves drying green; outer flowers of triads female.....*V. monoicum*
2 Leaves drying yellow; outer flowers of triads male.....*V. mysorense*
1 Leaves none or reduced to scales.

3 Internodes flattened; leaves scaly.....*V. nepalense*
3 Internodes 4-angled; leaves none.....*V. angulatum*

Viscum angulatum Heyne ex DC., Prodr. 4: 283. 1830; Gamble, Fl. Madras 1260(881). 1925. *Viscum ramosissimum* Wall. ex Wight, Ic. t. 1017. 1845.

Stems 4-angled, leafless, pendulous.

Indomalaysia. Common in plains and Ghats on *Scutia myrtina* and *Symplocos laurina.* March-September. *CJS* 14379, 16842.

Viscum monoicum Roxb. ex DC., Prodr. 4: 278. 1830; Gamble, Fl. Madras 1259(880). 1925.

Leafy, pendulous. Stems terete. Leaves to 8×2.5 cm, ovate-lanceolate, falcate, 3-5-nerved.

Throughout India, Sikkim. Locally common at Chikkanahalli, on *Vitex altissima.* August. *HFP* 470.

Viscum mysorense Gamble, Bull. Misc. Inform. 329. 1925; Fl. Madras 1260(881). 1925.

Leafy. Internodes angled or flat and ribbed. Leaves few, opposite, oblanceolate, 3-nerved, to 3.75×0.75 cm. Inflorescence in 3-flowered glomerules; laterals male.

Arsikere in Karnataka. The species has not been collected since Meebold, in 1908. *Meebold* 8207! (K). The plant dries yellow.

Viscum nepalense Spreng., Syst. Cur-Post. 47. 1827; Danser, Blumea 4: 283. 1936. *Viscum articulatum* auct. non N. Burman, 1768: J. Hooker, Fl. Brit. India 5: 226. 1886; Gamble, Fl. Madras 1260(881). 1925.

Stems flattened, pendulous. Leaves scaly.

Indomalaysia. Common in plains and Ghats on species of *Ziziphus, Terminalia Semecarpus, Lagerstroemia.* January-August. *CJS* 13028, 16695.

Note: Danser considered *V. nepalense* Spreng. to be distinct from the real *V. articulatum* Burm. He has been followed in this by Santapau, *Fl. Khandala* ed. 3, 238-39. 1967. Rao however (*J. Indian Bot. Soc.* 36: 113-168. 1957) considered the Burman species to be conspecific with Sprengel's. Wiens (*l.c.*) has followed Rao.

80. BALANOPHORACEAE

T. P. Ramamoorthy

BALANOPHORA J. & G. Forster

Yellow to pink, fleshy root-parasites with a tuberous, woody rhizome. Leaf scales alternate, opposite or whorled, imbricate, sometimes absent. Inflorescence terminal, usually bursting out of the rhizome, of fleshy

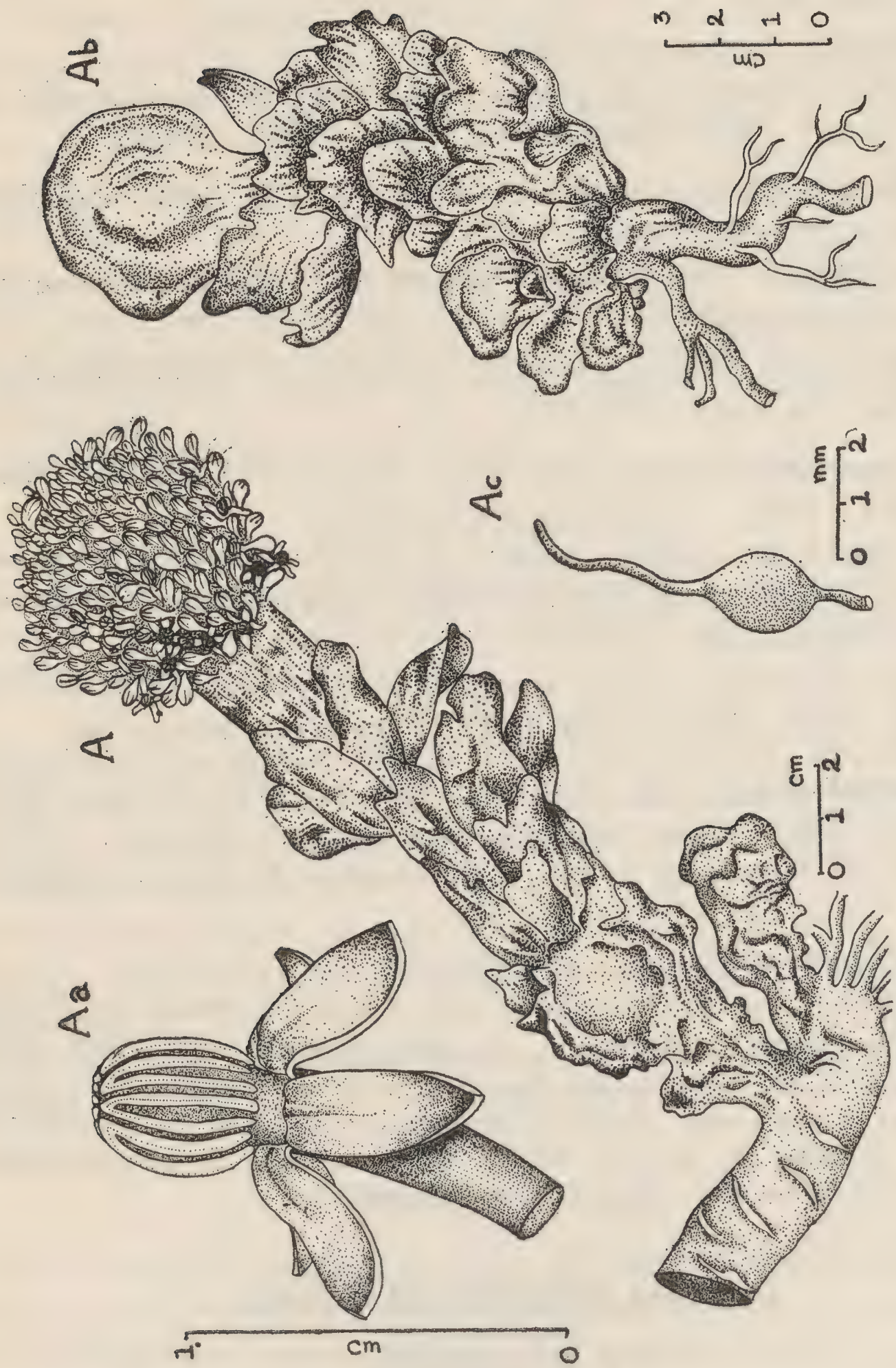


Fig. 61. BALANOPHORACEAE. *A. Balanophora fungosa* ssp. *indica*: male plant; *Aa*, staminate flower; *Ab*, female plant; *Ac*, pistillate flower.

unisexual, sometimes bisexual; spadices with numerous, stalked flowers often intermixed with bracts of spadices. Flowers unisexual, regular. Perianth usually 3-merous, free or connate, valvate in bud, generally absent in female. Stamens as many as tepals, free to connate into synandrium. Ovary naked (inferior in other genera), 1-locular; ovule 1, pendulous; style simple. Fruit an indehiscent nut.

Balanophora fungosa J. & G. Forster, Char. Gen. Pl. 99, t. 50. 1776.

ssp. **indica** (Arn.) Hansen, Dansk Botanisk Arkiv 28: 100. 1972. *Langsdorffia indica* Arn., Ann. Nat. Hist. 2: 37. 1838. *Balanophora indica* (Arn.) Wall. ex Griffith, Trans. Linn. Soc. London 20: 95. 1846; Gamble, Fl. Madras 1263(885). 1925.

Tubers crowded, reddish-brown. Leaf scales broad-based, spiral. Male flower subtended by bracts; tepals 5, free; synandrium obconical.

Indomalaysia to Australia. Common in upper Ghats, in shade in wet deciduous to semi-evergreen forests, on roots of *Euonymus indicus, Syzygium cumini.* December-February. *CJS* 11562, 15955 (male), 15899 (female).

81. HIPPOCRATEACEAE

T. P. Ramamoorthy

Usually climbing shrubs. Leaves usually opposite and coriaceous; stipules minute, caducous; blade simple, mostly entire, penninerved. Inflorescence usually cymose and axillary. Flowers bisexual, regular usually 5-merous. Sepals imbricate, connate below, persistent; petals free, imbricate. Disc fleshy, usually prominent. Stamens 3, inserted toward the inner margin of disc; filaments flat, dilated below, recurved during anthesis; anthers transversely dehiscent. Ovary superior, more or less immersed in disc, 3-locular; ovules 2-8 in each, axile; style short; stigma usually 3-lobed. Fruit capsular with 3 divergent, flattened follicles or a berry. Seeds often winged.

Note: Included in *Celastraceae* by Ding Hou, Fl. Malesiana ser. 1, 6: 231. 1962.

1 Fruit a berry; inflorescence of sessile fascicles.....**Salacia**
1 Fruit of follicles; inflorescence a pedunculate corymb of cymes.
2 Inflorescence with supplementary branches at the dichotomies; leaves crenulate, with distinct acumen.....**Reissantia**
2 Inflorescence without supplementary branches at the dichotomies; leaves entire, acute.....**Loeseneriella**

LOESENERIELLA A. C. Smith

Stipules intra-petiolar. Cymes collected into pedunculate corymbs. Calyx imbricate, persistent; petals sometimes tomentose; disc prominent,

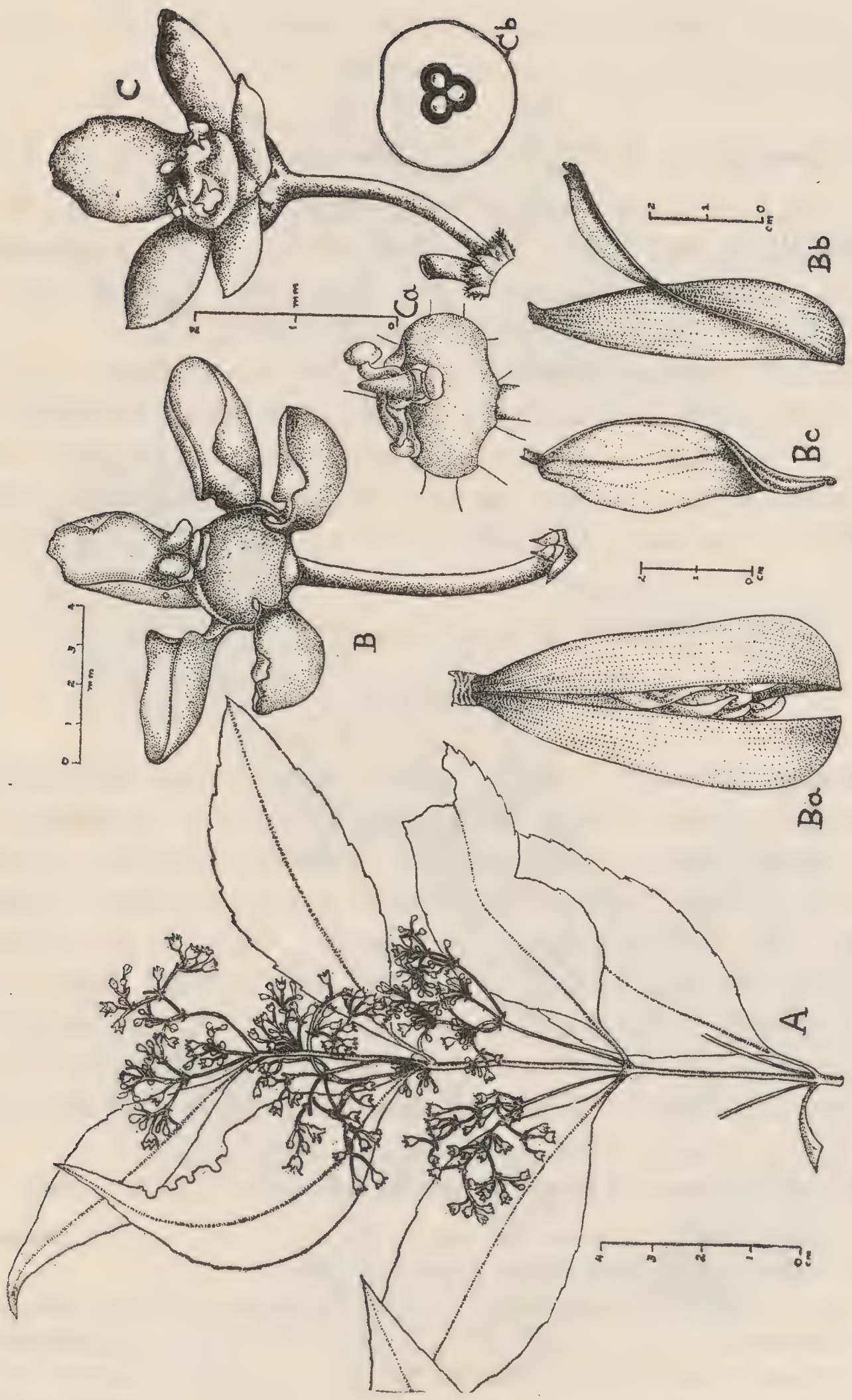


Fig. 62. HIPPOCRATEACEAE. *A. Reissantia indica*: flowering branch. *B. Loeseneriella arnottiana*: flower; *Ba*, single 'follicle' separated from capsule; *Bb*, valve; *Bc*, winged seed. *C. Salacia macrosperma*: flower; *Ca*, ovary immersed in disc; *Cb*, same, in cross section.

fleshy. Locules usually 4-ovuled. Fruit of 3, divergent, dorsiventrally flattened 'follicles', dehiscing along a median suture into 2 valves. Seeds winged.

1 Buds globose; petals clawed ..... *L. arnottiana*
1 Buds ovate-acute; petals not clawed ..... *L. bourdillonii*

Loeseneriella arnottiana (Wight) A. C. Smith, J. Arnold Arbor. 16: 174. 1945. *Hippocratea arnottiana* Wight, Ill. 1: 133, t. 46, f. 47. 1840, Gamble, Fl. Madras 213(153). 1918.

A climbing shrub. Leaves to 10.5 × 6 cm, elliptic-oblong, rounded at both ends. Bud globose; petals glabrous, clawed at base, spatulate. Disc glabrous. Ovules 2 per carpel. Capsular 'follicles' each 2-seeded.

South W. India. Common in semi-evergreen forests in lower Shiradi Ghat. January-March. *CJS* 11624, 15971.

Loeseneriella bourdillonii (Gamble) Ramam. *comb. nov.* *Hippocratea bourdillonii* Gamble, Bull. Misc. Inform. 132. 1916; Fl. Madras 213(153). 1918.

Distinguished from the preceding species by the ovate, acute, puberulous buds; petals not clawed, puberulous on the inside, obscurely corniculate at tip.

South W. India. Common in semi-evergreen forests towards streams in lower Bisle Ghat. January. *CJS* 16000, 16038, *HFP* 252.

Note: *HFP* 2666, From Kagenari State Forest (Shiradi Ghat) differs from the other species in its hairy petals and the disc which is pilose on the upper half. Flowers greenish. February.

REISSANTIA Halle

Stipules often laciniate; blade crenulate. Inflorescence axillary; cymes branching. Flowers minute. Disc fleshy, obscure. Locule usually 2-ovuled. Fruit capsular, similar to *Loeseneriella*. Seeds winged.

Reissantia indica (Willd.) Halle, Mem. Inst. Franc. Afrique Noire n. 64: 85. 1962; Ding Hou, Blumea 12: 33. 1963; in Steenis, Fl. Malesiana ser. 1, 6: 401. 1964. *Hippocratea indica* Willd., Sp. Pl. 1: 93. 1797; Gamble, Fl. Madras 213(153). 1918. *Pristimera indica* (Willd.) A. C. Smith, Amer. J. Bot. 28: 440. 1941.

Climbing shrub. Leaves to 9.5 × 3.5 cm, elliptic-oblong-lanceolate, acuminate, cuneate; stipules laciniate. Flowers yellow. Sepals ovate, acute; petals lanceolate, acute.

Indomalaysia. Rare, collected once in semi-evergreen forests in lower Bisle Ghat. February. *CJS* 16427.

SALACIA Linnaeus

Inflorescence fasciculate. Disc fleshy, surrounding ovary. Locules 1-2-ovuled; style simple; stigma obscure. Fruit a fleshy, usually warty berry. Seeds few-many.

Salacia macrosperma Wight, Ic. t. 962. 1845; Gamble, Fl. Madras 215(154). 1918.

Large climbers; branchlets often twisted around supports. Leaves 5-12×2.5-5 cm. Flowers pedicelled, green; calyx lobes fimbriate. Fruit a large, fleshy, rough berry.

South W. India. Common in wet deciduous to semi-evergreen forests in Ghats. February-May. *CJS* 12937, 13618, *HFP* 2674.

82. CELASTRACEAE

T. P. Ramamoorthy

Woody. Leaves usually opposite; stipules if present, minute and caducous; blade usually entire, pinnately veined. Inflorescence usually of axillary cymes. Flowers usually bisexual, regular, 4-5-merous. Sepals shortly connate at base, imbricate, persistent; petals usually free, imbricate. Disc usually conspicuous. Stamens free. Ovary superior, usually immersed in disc, 2-5-locular; ovules usually 2 in each locule, usually basal; style simple, short; stigma usually lobed. Fruit usually a 3-valved, loculicidal capsule; seeds usually arillate.

1 Leaves alternate.
2 Unarmed shrubby climber with inflorescence terminating branches. Ovary free from disc..... **Celastrus**
2 Usually armed, erect or scandent shrubs with axillary or extra-axillary inflorescence; sometimes inflorescence borne on spines. Ovary imbedded in disc.... **Maytenus**
1 Leaves opposite.
3 Flowers sessile; petals erect, connate at base..... **Microtropis**
3 Flowers pedicelled; petals spreading, free.
4 Petals cristate, continuous with disc..... **Lophopetalum**
4 Petals smooth, arising from below the margin of disc.
5 Ovary 3-5-locular; fruit capsular..... **Euonymus**
5 Ovary 3-locular; fruit drupaceous..... **Cassine**

CASSINE Linnaeus

Note: Elaeodendron is united with *Cassine,* following Ding Hou, *Fl. Malesiana* ser. 1, 6: 284. 1962.

Leaves usually crenulate. Inflorescence peduncled. Stamens inserted at or under margin of disc. Disc flat, fleshy, entire to lobed.

Fig. 63. CELASTRACEAE. *A. Cassine paniculata*: flowering branch; *Aa*, flower; *Ab*, same, in vertical section; *Ac*, ovary, cross section; *Ad*, fruit. *B. Lophopetalum wightianum*: flower, top view. *C. Euonymus indicus*: fruit.

Ovary usually partly immersed in disc, conical, 2-3-locular; ovules 2 in each cell, basal; stigma sometimes entire. Fruit indehiscent, fleshy, drupaceous, 1-2-seeded. Seeds not arillate.

1 Petals 0.2-0.25 cm, orbicular; ovary 2-locular.....*C. glauca*
1 Petals 0.45-0.5 cm, spatulate, margin towards base reflexed; ovary 3-locular.....*C. paniculata*

Cassine glauca (Rottb.) Kuntze, Rev. Gen. Pl. 1: 114. 1891; Ding Hou in Steenis, Fl. Malesiana ser. 1, 6: 286. 1962. *Mangifera glauca* Rottb., Nye Saml. Kongel. Norske Vidensk. Selsk. Skr. 2: 534. t. 4, f. 1. 1783. *Elaeodendron glaucum* (Rottb.) Persoon, Syn. Pl. 1: 241. 1805; Gamble, Fl. Madras 211(152). 1918. *Elaeodendron roxburghii* Wight & Arn., Prodr. 157. 1834; Bedd., Fl. Sylv. t. 148. 1871.

C. albens

Trees. Leaves 5-12×5 cm, crenate-serrate, orbicular-elliptic, acuminate with acumen often folded. Inflorescence 2-3-branched, 4.5-7 cm long. Flower greenish-white. Ovary 2-locular. Drupe obovoid, 1-seeded.

Indomalaysia. Occasional in dry deciduous forests in the hills on eastern plains. September. *CJS* 17880, *HFP* 596.

Cassine paniculata (Wight & Arn.) Raman. *comb. nov.* *Elaeodendron paniculatum* Wight & Arn., Prodr. 157. 1834; Gamble, Fl. Madras 212(152). 1918.

Large trees. Leaves bluntly crenate, 7-8×2.5-3.5 cm, ovate-lanceolate, acute to shortly acuminate, drying black or reddish-brown. Inflorescence 6-7 cm, with often a solitary flower at the fork of inflorescence dichotomies. Flower larger than in the preceding species. Ovary 3-locular. Drupe elliptic, fleshy, 2-seeded.

Western Ghats. Rare. Collected only once in wet deciduous forest at Vanagur, in upper Bisle Ghat. April. *HFP* 1575.

CELASTRUS Linnaeus

Leaves alternate. Inflorescence of usually terminal cymes collected into thyrsoid panicles. Flowers polygamous, 5-merous. Disc cupular, lobed. Stamens (staminodes in female) inserted just outside disc; pistillode reduced and conical in male. Ovary not immersed in disc, (2-) 3-locular; ovules 2 in each, basal; stigma (2-) 3-lobed and spreading. Capsule 3-valved, loculicidal, 1-6-seeded. Seeds crimson-arillate.

Celastrus paniculatus Willd., Sp. Pl. 1: 1125. 1797; Wight, Ic. t. 158. 1839; Gamble, Fl. Madras 208(150). 1918. *Celastrus rothianus* Schultes in Roemer & Schultes, Syst. 5: 423. 1820. *Ceanothus paniculatus* Roth, Nov. Pl. Sp. 154. 1821, *nom. superfl.*

Deciduous, shrubby climber. Leaves 5-10×3-5 cm, ovate, elliptic, crenulate. Inflorescence terminal. Sepals fimbriate at tip. Fruit tipped by persistent style.

S. Asia to Australia. Common in deciduous and semi-evergreen forests in plains and Ghats. April-June. *CJS* 14534, 16592, *HFP* 1469.

EUONYMUS Linnaeus

Sepals reflexed in fruit. Disc fleshy, flat, angled or lobed. Stamens inserted on disc or its margin. Ovary partly immersed in disc, 3-5-locular; ovules 2 in each locule, axile near base; stigma obscure. Capsule 3-5-angled. Seeds to 6, crimson-arillate.

Euonymus indicus Heyne ex Wall. in Roxb., Fl. Ind. 2: 409. 1824; Gamble, Fl. Madras 202(146). 1918. *Euonymus goughii* Wight, Ic. t. 215. 1839; Ill. 1: 78. 1840.

Small evergreen trees. Leaves 7-10×3.5-5 cm, elliptic-ovate. Cymes few-flowered. Sepals erose at tip; petals obovate, somewhat narrowed at base, laciniate at tip, occasionally dark-pitted; disc fleshy, 5-angled. Fruit 1.2-1.8 cm, smooth, obovate, concave at tip.

South W. India. Common in wet deciduous to semi-evergreen forests in upper and lower Ghats. All seasons. *CJS* 13670, 15804, *HFP* 43.

LOPHOPETALUM Wight & Arnott

Sepals reflexed or not, usually rounded. Petals 5, inner surface covered with cristate, lamellate or fimbriate appendages, flat, broad, lobed. Stamens inserted on disc, sometimes toward the margin. Ovary sunk in disc, 3-celled; ovules 4-many in each, basal; stigma obscure. Fruit loculicidally 3-valved, woody capsule with many, winged seeds.

Lophopetalum wightianum Arn., Ann. Nat. Hist. 3: 151. 1839; Wight, Ic. t. 162. 1839; Bedd. Fl. Sylv. t. 142. 1871; Gamble, Fl. Madras 205(147). 1918.

Lofty evergreen tree. Leaves broadly ellitic, acute, somewhat rounded at base, entire, 5-14×3-6 cm, Sepals green. Petals yellow with red, lamellate appendages on the inside, crenulate at tip. Capsule 12 cm long.

Indomalaysia. Common in semi-evergreen forests in lower Ghats. December-May. *CJS* 15866, 16208, *HFP* 1686.

MAYTENUS Molina

Leaves alternate. Sepals connate at base, often erose at tip. Disc

flattened, sinuate-lobed. Stamens inserted outside disc or on margin. Ovary sunk in disc (ours), 3-locular; ovules 2, basal; stigma sessile. Capsule 3-valved, 2-6-seeded; seeds arillate.

1 Armed or unarmed, erect deciduous shrubs; leaves crenulate; flowers in cymes and peduncled ..... *M. emarginata*
1 Unarmed, scandent, evergreen shrubs; leaves entire; flowers fascicled and sessile .... *M. rothiana*

Maytenus emarginata (Willd.) Ding Hou in Steenis, Fl. Malesiana ser. 1, 6: 241. 1962. *Celastrus emarginatus* Willd., Sp. Pl. 1: 1128. 1798. *Celastrus montanus* Roth in Roemer & Schultes, Syst. 5: 427. 1819; Wight, Ic. t. 382. 1840. *Gymnosporia montana* (Roth) Bentham, Fl. Austral. 1: 400. 1863; Gamble, Fl. Madras 209(150). 1918. *Gymnosporia emarginata* (Willd.) Thwaites, Enum. 409. 1864; Gamble, Fl. Madras 210(151). 1918.

Armed or unarmed, erect shrubs. Leaves 4-7×2-4 cm, usually obovate and emarginate, serrate, drying a glaucous green or reddish-brown. Inflorescence axillary, extra-axillary or borne at tip of spines, pedunculate. Flower white. Sepals 5, petals 5; capsule usually concave at tip.

Indomalaysia. Common in plains and upper Ghats, usually in open country or in association in deciduous forests. August-February. *CJS* 11995, 12156, *HFP* 1209, 2560.

Maytenus rothiana (Walp) Ramam. *comb. nov.* *Celastrus serrulatus* Roth, Nov. Pl. Sp. 156. 1821, non R. Brown, 1810. *Celastrus rothianus* Wight & Arn., Prodr. 159. 1834, non Schultes, 1820. *Catha rothiana* Walp., Rep. 1: 532. 1842. *Gymnosporia rothiana* (Walp.) Lawson in J. Hooker, Fl. Brit. India 1: 620. 1875. *Maytenus wightiana* Babu, Bull. Bot. Surv. India 10: 349. 1969.

Unarmed, scandent shrubs to 3-4 m. Leaves 9-10×5-6 cm, broadly elliptic-obovate, narrowed and acute at base, obtuse at tip. Flower white. Fruit 6-seeded.

South W. India. Occasional amongst undergrowth of semi-evergreen forests in lower Shiradi Ghat. April. Taxon overlooked by Gamble. *CJS* 16937.

Note: The example in the note of Article 72 (I.C.B.N.) gives a clear precedent for recognizing *rothiana* as a new and legitimate specific epithet dating from 1842 (*Catha rothiana* Walp.) not from 1834 (*Celastrus rothianus* Wight & Arn.). If *Catha rothiana* (1842) is legitimate, then its epithet must be adopted in the genus accepted (*Maytenus*) because it is priorable and does not create a later homonym.

MICROTROPIS Wallich ex Meisner *nom. cons.*

Sepals unequal. Petals shortly connate at base, erect. Disc annular

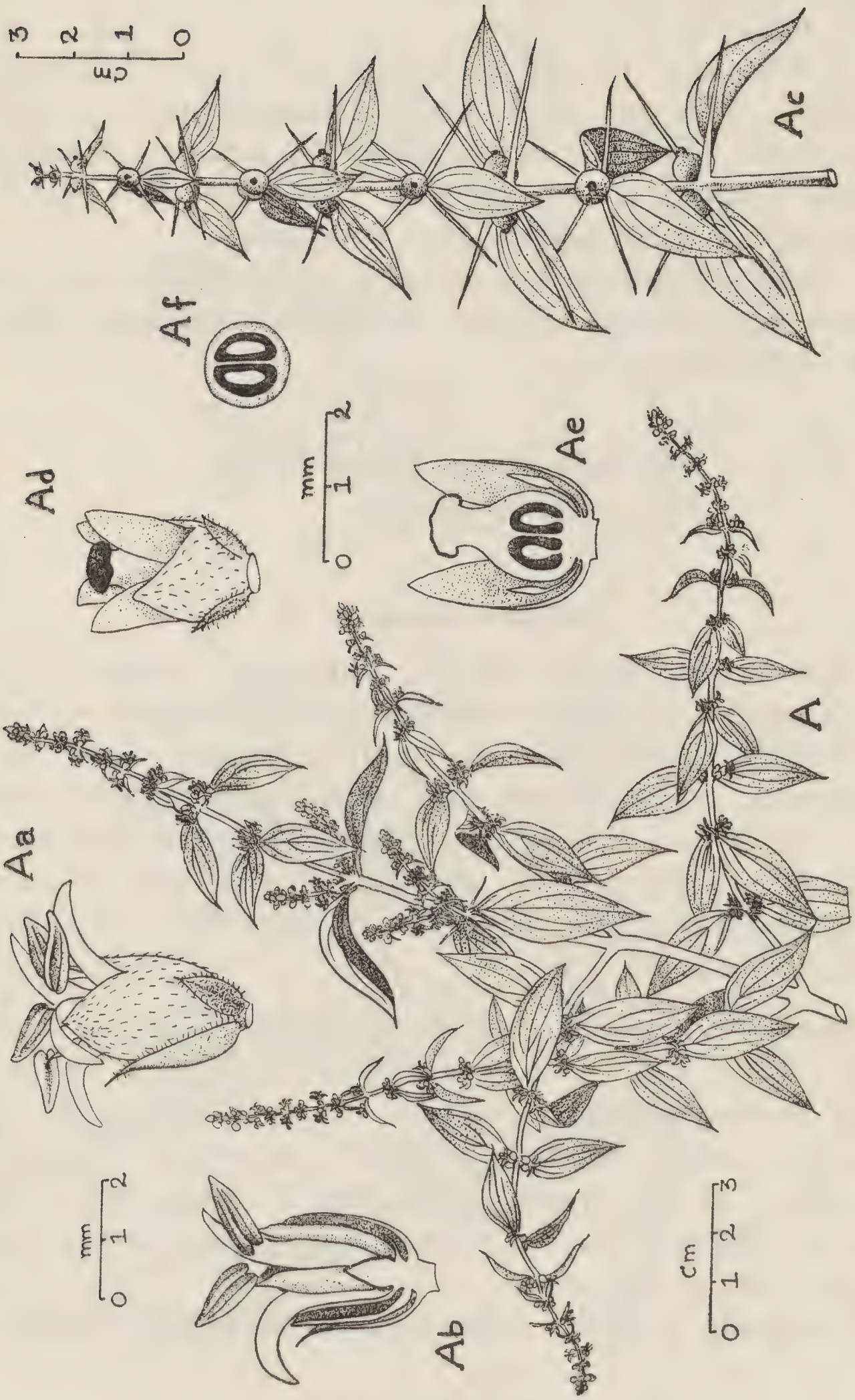


Fig. 64. SALVADORACEAE. *A. Azima tetracantha*: flowering twig; *Aa*, male flower; *Ab*, same, in section; *Ac*, fruiting twig; *Ad*, female flower; *Ae*, same, in section; *Af*, section of ovary.

or none. Stamens inserted on disc. Ovary free from disc, globose at base, 2-3-locular; ovules 2 in each locule, axile; stigma obscure. Fruit fleshy capsular, 2-valved, 1-seeded. Seed red-arillate.

Microtropis stocksii Gamble, Bull. Misc. Inform. 132. 1916; Fl. Madras 206(148). 1918.

Evergreen tree with blue-black branches. Leaves 7-16×4-7 cm, broadly elliptic, with very short acumen, cuneate, pale green below, dark green above. Fascicles of flowers sessile, axillary. Sepals green, unequal, outer 3 larger, apex erose in all. Petals greenish-white. Fruit 1.5×1.6 cm, oblong, smooth, rounded at both ends.

South W. India. Common in semi-evergreen to wet deciduous forests of lower and upper Ghats, towards the banks of streams. February-June. *CJS* 12808, *HFP* 215.

83. SALVADORACEAE

K. N. Gandhi

AZIMA Lamarck

Shrubs, armed with axillary thorns, dioecious. Leaves opposite; blade simple, entire; venation subpalmate. Inflorescence a raceme, fascicle or panicle; bracts foliaceous or 0; bracteoles linear. Flowers regular, 4-merous. Calyx shortly 4-fid or in female flowers irregularly 2-4-partite. Petals free, oblong, imbricate. Stamens 4; anthers medifixed; pistillode usually present. Staminodes 4. Ovary superior, 2-locular, with 2 basal ovules per locule; stigma subsessile, capitate or 2-fid. Fruit a berry, 1-2-seeded.

Azima tetracantha Lam., Encycl. 1: 343. 1783; Gamble, Fl. Madras 800(562). 1923.

Rambling shrubs; branchlets angular; thorns conspicuous. Leaves elliptic-lanceolate, acute, cuspidate, to 4×2.5 cm, with 2-3 pairs of basal veins. Flowers in axillary clusters passing into a terminal spike of interrupted whorls. Calyx hairy. Corolla greenish-yellow. Stigma capitate. Berry globose, white, 6 mm across.

India. Occasional in plain. March-June. *CJS* 9510, 16488.

84. ICACINACEAE

T. P. Ramamoorthy

Woody. Leaves usually alternate, estipulate, simple, usually entire and pinnately veined. Inflorescence various. Flowers bisexual or

Fig. 65. ICACINACEAE. *A. Sarcostigma kleinii*: flowering branch. *B. Gomphandra tetrandra*: flower; *Ba*, same, vertical section. *C. Miquelia dentata*: flowering branch; *Ca*, staminate flower. *D. Apodytes dimidiata*: flower. *E. Nothapodytes foetida*: flower.

unisexual, regular, 4-5-merous. Calyx lobes imbricate, persistent. Petals free or connate, valvate, deciduous. Disc present or absent. Stamens usually free. Ovary superior, usually 1-locular; ovules 2, pendulous; style usually terminal; stigma 1. Fruit drupaceous, 1-seeded.

1 Climbers.
2 Inflorescence spicate; leaves entire.....**Sarcostigma**
2 Inflorescence capitate, appearing umbellate because of elongate pedicel-like corolla tube; leaves dentate.....**Miquelia**
1 Trees or shrubs.
3 Inflorescence axillary, few-flowered; petals connate.....**Gomphandra**
3 Inflorescence terminal, many-flowered; petals free.
4 Petals villous; style terminal.....**Nothapodytes**
4 Petals glabrous; style eccentric (lateral).....**Apodytes**

APODYTES E. Meyer

Trees. Inflorescence usually of terminal, corymbose cymes. Flowers bisexual, 5-merous. Petals glabrous. Ovary obliquely gibbous; style lateral; stigma indistinct. Drupe obliquely compressed.

Apodytes dimidiata E. Meyer ex Arn., J. Bot. (Hooker) 3: 155. 1840.

var. **acutifolia** (A. Rich) Boutique, Fl. Congo Belge 9: 274. 1960. *Apodytes acutifolia* A. Rich., Tent. Fl. Abyss. 1: 92. 1847. *Apodytes beddomei* Masters in J. Hooker, Fl. Brit. India 1: 588. 1875; Gamble, Fl. Madras 195(140). 1915.

Trees to 20 m. Leaves 6-12.5×3-6.25 cm, ovate, acuminate, somewhat unequal to base. Flowers white with pilose pedicels. Petals reflexed. Ovary glabrous. Drupe 1×0.6 cm, oblique.

Tropical Africa to Malaysia. Common in wet deciduous forests in upper Ghats. May-June. *CJS* 16856, *HFP* 107, 1897.

Note: Sleumer (*Blumea* 17: 185. 1969) reduces *A. benthamiana* Wight and *A. beddomei* Masters, both listed by Gamble, to synonymy under *A. dimidiata.* He does not accept any varieties. However, Grenville Lucas in *Flora of West Tropical Africa* recognizes two varieties based mainly on the indumentum on the ovary. Others treat these varieties as subspecies.

GOMPHANDRA Wallich ex Lindley

Inflorescence usually of axillary cymes. Flowers polygamodioecious, sessile. Calyx cupular. Petals connate in elongate tube. Stamens proximate; filaments fleshy with tuft of hairs above anthers; pistillode sunk in the annular disc. Ovary elongate; stigma discoid, persistent. Drupe elongate, smooth, 1-seeded.

Gomphandra tetrandra (Wall.) Sleumer, Notizbl. Bot. Gart. Berlin-Dahlem 15: 238. 1940. *Lasianthera tetrandra* Wall. in Roxb., Fl. Ind.

2: 328. 1824. *Gomphandra polymorpha* Wight, Ill. 1: 103. 1840; Gamble, Fl. Madras 195(139). 1915.

Shrubs to 5 m. Leaves 9-11 × 5-6 cm, elliptic-lanceolate, acuminate, cuneate-rounded. Flowers white, in axillary cymes.

South W. India, Sri Lanka. Common in wet deciduous to semi-evergreen forests in the Ghats, usually in undergrowth. February-October. *HFP* 858, 1902.

MIQUELIA Meisner *nom. cons.*

Leaves dentate, palmately veined. Inflorescence supra-axillary, usually capitate. Flowers dioecious. Staminate flower: calyx minute; petals fused in elongate tube; pistillode 0. Pistillate flower: petals nearly free; ovary sessile; stigma sessile, cuplike; staminodes 4-5. Drupe oblong, more or less compressed.

Miquelia dentata Bedd., Madras J. Lit. Sci. ser. 3, 1: 38. 1864; Gamble, Fl. Madras 197(141). 1915.

Slender climbing shrubs. Leaves long-petioled, to 12 × 6 cm, oblong, acuminate, cuneate, membranous. Peduncles elongate. Flowers 4-merous; corolla tube in male elongate, 0.8 cm long, simulating pedicel, green.

Anamalais, now Hassan. Rare in undergrowth of semi-evergreen forest in lower Bisle Ghat. March. *CJS* 16667.

NOTHAPODYTES Blume

Cymes usually terminal, many-flowered, corymbose. Flowers bisexual, 5-merous. Calyx toothed. Disc cupular. Stigma thick.

Nothapodytes foetida (Wight) Sleumer, Notizbl. Bot. Gart. Berlin-Dahlem 15: 247. 1940; Sant., Fl. Khandala ed. 3, 40. 1967. *Stemonurus foetidus* Wight, Ic. t. 955. 1845. *Mappia foetida* (Wight) Miers, Ann. Mag. Nat. Hist. ser. 2, 9: 395. 1852; Gamble, Fl. Madras 197(141). 1913.

Arborescent shrubs. Leaves 10-30 × 7-14 cm, ovate-oblong, acute-acuminate at tip, rounded and asymmetrical at base, hairy beneath. Peduncle and pedicels hairy. Flowers dirty-white, emitting an unpleasant odor. Petals villous. Drupe smooth, oblong, 1 × 0.6 cm.

China, India, Malaysia. Common under light cover in western plains and upper Ghats. June-October. *CJS* 14344, 14519, *HFP* 1977.

Note: The conserved name *Mappia* N. Jacquin is now restricted to the Neotropics.

SARCOSTIGMA Wight & Arnott

Spikes supra-axillary, pendulous, elongate, interrupted. Flowers sessile, dioecious, 4-5-merous. Calyx cupular, irregularly toothed. Petals shortly connate below. Pistillode usually present. Ovary oblong, usually hairy; stigma thick, sessile, obliquely reniform; staminodes present or absent.

Sarcostigma kleinii Wight & Arn., Edinburgh New Philos. J. 14: 299. 1833; Wight, Ic. t. 1854. 1852; Gamble, Fl. Madras 199(142). 1915.

Profusely branching, climbing shrubs. Leaves 10-18×3.5-9.5 cm, broadly oblong-lanceolate, acute, rounded below. Spikes pendulous. Flowers yellow. Drupe 3×1.5 cm, elliptic-oblong, smooth, orange red.

South India, Malaysia. Common in undergrowth of wet deciduous to semi-evergreen forests, sometimes climbing over trees in Ghats. Flowers from October; remaining in fruit over a long period. *CJS* 16381, *HFP* 827.

85. DICHAPETALACEAE

T. P. Ramamoorthy

DICHAPETALUM Du Petit-Thouars

Shrubs or small trees. Leaves alternate, distichous; stipules minute, deciduous; blade simple, entire, pinnately veined. Inflorescence axillary, of umbelliform corymbs. Flowers dioecious, regular. Pistillate flowers appearing bisexual but not shedding pollen. Sepals 5, connate at base, imbricate. Petals free, emarginate or deeply bifid. Stamens 5, adnate to base of petals. Disc of 5 glands, opposite petals. Ovary superior, 2-locular; ovules 1 per locule, pendulous; style 1-2-branched; stigmas capitate. Fruit 1-2-lobed drupe.

Dichapetalum gelonioides (Roxb.) Engl. in Engl. & Prantl, Pflanzenfam. 3(4): 348. 1891; Gamble, Fl. Madras 188(134). 1915; Leenhouts in Steenis, Fl. Malesiana ser. 1, 5: 310. 1957. *Moacurra des* Roxb., Fl. Ind. 2: 69. 1832.

Shrubs to 4 m. Stipules lanceolate, 0.3 mm, deciduous; leaf-blade 5-11×2-4 cm, oblong-elliptic, acute, cuneate-rounded. Flowers fascicled, stalked. Sepals ovate, rounded at tip, externally hairy; petals white, elliptic, notched or deeply bifid at tip. Drupe 1-2-lobed, pubescent, 1-2-seeded.

South W. India, Sri Lanka, Sumatra. Common in Ghats, usually in undergrowth of semi-evergreen forests or along outskirts of wet deciduous forests. All seasons. *CJS* 12073, *HFP* 1660.

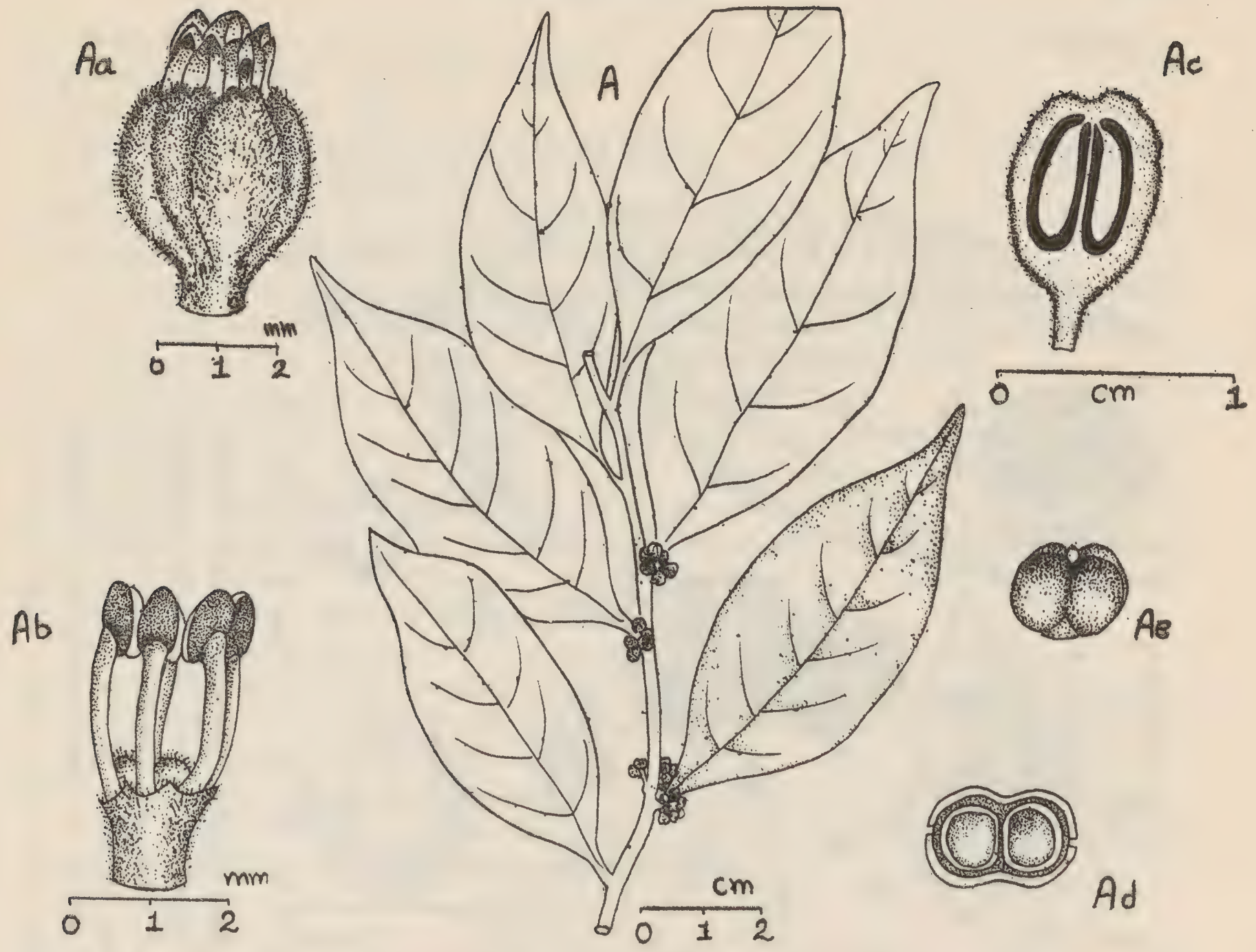


Fig. 66. DICHAPETALACEAE. *A. Dichapetalum gelonioides*: flowering twig; *Aa*, staminate flower; *Ab*, staminate flower without calyx and corolla; *Ac*, ovary, vertical section; *Ad*, same, cross section; *Ae*, fruit.

86. EUPHORBIACEAE

T. P. Ramamoorthy

Plants usually woody. Leaves usually alternate and stipulate; blade usually simple and entire; venation usually pinnate. Inflorescence usually of axillary racemes or spikes, bracteate. Flowers unisexual, regular, usually monoecious with upper flowers male. Perianth usually biseriate with outer whorl deeply imbricate and lobed; the inner whorl free. Stamens 1-many, usually free; anthers usually with 2 parallel cells, basifixed. Disc usually present. Ovary superior, usually 3-locular; ovules 1 or 2 per locule, axile; style usually persistent, 3-branched, each branch bifid. Fruit usually a schizocarp with three 2-valved cocci or a septicidal capsule, rarely drupaceous.

1 Flowers naked, arranged in flower-like cyathia.....**Euphorbia**
1 Flowers with perianth, not arranged in cyathia.
2 Plants twining, with stinging hairs.....**Tragia**
2 Plants erect, without stinging hairs.

Fig. 67. EUPHORBIACEAE. *A. Fahrenheitia zeylanica*: branch with male flowers. *B.* pistillate flower. *C. Breynia retusa*: branch with male flowers. *D. Bridelia crenulata*: pistillate flower. *E. Mallotus tetracoccus*: fruit. *F. Agrostistachys indica*: branch with male flowers. *G. Homonoia riparia*: staminate flower; *Ga*, ovary, cross section. *H. Antidesma menasu*: staminate flower. *I. Givotia rottleriformis*: staminate flower. *J. Bischofia javanica*: pistillate flower; *Ja*, ovary, cross section.

3 Leaves 3-foliolate.....**Bischofia**
3 Leaves simple, albeit deeply lobed in some.
4 Leaves peltate more than 1 cm.
5 Leaves red-glandular beneath, scarcely lobed.....**Macaranga**
5 Leaves eglandular beneath, lobed.
6 Petiole glandular at tip; leaf margin serrate; stamens many.....**Ricinus**
6 Petiole eglandular at tip; leaf margin entire; stamens few.
7 Leaves lobed more than half-way; perianth uniseriate.....**Manihot**
7 Leaves lobed less than half-way; perianth biseriate.....**Jatropha**
4 Leaves not peltate or peltate less than 1 cm (*Mallotus tetracoccus*).
8 Leaves small (less than 3 cm long), obtuse to rounded.
9 Tepals glandular on the inside in both sexes; ovary truncate at tip; styles sunk in ovary tip.....**Synostemon**
9 Tepals, ovary, styles otherwise.
10 Disc none; male calyx turbinate with truncated lobes; fruit dry; stamens 3, united.....**Breynia**
10 Disc present; calyx spreading; lobes obtuse to acute.
11 Stamens 5.
12 Stamens all free; pistillode large; fruit white, coriaceous.....**Securinega**
12 Stamens 3 united, 2 free; pistillode 0; fruit fleshy.....**Kirganelia**
11 Stamens 3.
13 Leaves narrow; fruit fleshy.....**Emblica**
13 Leaves ovate or obovate; fruit dry.....**Phyllanthus**
8 Leaves larger, obtuse to acute, sometimes rounded.
14 Herbs.
15 Venation pinnate.....**Sebastiania**
15 Venation palmate.
16 Leaves lobed.....**Chrozophora**
16 Leaves serrate.
17 Leaves lanceolate; pubescence stellate.....**Croton**
17 Leaves ovate; pubescence simple.....**Acalypha**
14 Trees or shrubs, some scrambling.
18 Venation palmate.
19 Leaves opposite.....**Trewia**
19 Leaves alternate.
20 Leaves densely lepidote-scaly below.....**Croton**
20 Leaves not lepidote; pubescence stellate.
21 Leaves peltate; perianth uniseriate; disc 0; fruit a schizocarp.....**Mallotus**
21 Leaves not peltate; perianth biseriate; disc present; fruit a drupe.....**Givotia**
18 Venation pinnate.
22 Leaves opposite (subopposite in *Mallotus resinosus*); stem flattened.
23 Sap milky; leaves shining with more than 10 primary nerves; male flowers clustered in axils, subtended by bracts.....**Excoecaria**
23 Sap dull; leaves dull, with less than 10 primary nerves; male flowers not fascicled.....**Mallotus**
22 Leaves alternate; stem terete.
24 Leaves large (over 20 cm long).
25 Petiole biglandular at tip.....**Fahrenheitia**
25 Petiole eglandular at tip.
26 Leaves long acuminate.....**Agrostistachys**
26 Leaves rounded at tip.....**Drypetes**

24 Leaves less than 20 cm long.
27 Leaves rounded to obtuse at tip.....**Bridelia**
27 Leaves acute to acuminate.
28 Flowers clustered, on short branched cymes or fasciculate.
29 Flower staminate.
30 Stamens connate.....**Glochidion**
30 Stamens free.....**Margaritaria**
29 Flower pistillate.
31 Pedicels with ferruginous tomentum; leaves minutely puncticulate above .....**Aporosa**
31 Pedicels glabrous; leaves not puncticulate above.
32 Sepals 5; disc present; styles sessile.....**Margaritaria**
32 Sepals 5-6; disc 0; styles connate.....**Glochidion**
28 Flowers spicate-racemose or long-stalked.
33 Flowers in long-stalked umbels.....**Blachia**
33 Flowers spicate-racemose.
34 Lower leaf surface with scattered lepidote scales.....**Homonoia**
34 Lower leaf surface glabrous or with stellate pubescence.
35 Young growth with stellate pubescence.....**Epiprinus**
35 Young growth with simple pubescence or glabrescent.
36 Shoots pubescent.....**Antidesma**
36 Shoots glabrescent.....**Aporosa**

ACALYPHA Linnaeus

Leaves palmately 3-5-ribbed. Calyx 3-5-lobed; petals 0. Disc 0. Stamens generally 8, on a raised receptacle; anthers divaricate. Ovule 1 per locule; styles 3; stigmas 2-many-fid. Schizocarp small; seeds smooth, subglobose.

Acalypha malabarica Mueller, Linnaea 34: 42. 1865; Gamble, Fl. Madras 1330(930). 1925.

Annual hairy herbs. Blade 1-3×1-1.5 cm, ovate, crenate-serrate, palmately 5-ribbed. Spikes axillary; female flowers 2-3 in the axil of large, folded, toothed, pink bracts; teeth with gland-tipped hairs. Ovary pilose-hairy.

Central & Peninsular India. Fairly common in plains, in open country or around cultivated fields. September-November. *CJS* 11325, 11381, 15005.

AGROSTISTACHYS Dalzell

Leaves estipulate. Inflorescence usually short, extra-axillary, catkin-like, dioecious, bracteate; each bract with 1-many male flowers or a solitary female. Calyx valvate, 2-5-lobed in male, in female 5-6-lobed. Petals 5-8, free, shorter than calyx. Disc of fleshy glands, alternating with petals. Stamens 8-15, on a convex receptacle; anthers pendulous

from the thickened connective. Ovule 1 per locule; styles 2, short; stigmas bifid. Schizocarp subfleshy; seeds smooth.

Agrostistachys indica Dalzell, Hooker's J. Bot. Kew Gard. Misc. 2: 41. 1850; Bedd., Ic. t. 241. 1874; Gamble, Fl. Madras 1317(929). 1925; Balakrishnan, J. Bombay Nat. Hist. Soc. 67: 301. 1970.

Shrubs. Blade 14-35 × 5-14 cm, elliptic-lanceolate, acute at both ends, entire-sinuate. Male flowers sessile; female with an elongate jointed pedicel. Calyx of 2, concave lobes in male, 5 lobes in female. Petals 6, oblong, hairy in male; in female 5, oblong, soon deciduous.

Central & Peninsular India. Fairly common in undergrowth of wet deciduous forests in upper Ghats. November-May. *CJS* 12485 (male), 15907 (female), *HFP* 66.

ANTIDESMA Linnaeus

Flowers dioecious. Calyx 3-8-lobed. Petals 0. Disc fleshy, partitioned, hollowed, with cavities in male; annular-cupular in female. Stamens 2-5, inserted on disc; anthers divaricate; connective thickened; pistillode globose or none. Ovary 1-locular; ovules 2, pendulous; styles 2, short; stigmas 2-4, often lateral, recurving. Drupe with a 1-seeded pyrene.

Antidesma menasu Miq. ex Tul., Ann. Sei. Nat. Bot. ser. 3, 15: 215. 1851; Gamble, Fl. Madras 1297(908). 1925.

Trees to 10 m; shoots pubescent. Stipules large, ovate-lanceolate, subpersistent; leaf blade 12-20 × 3-7 cm, oblong-lanceolate, acute to acuminate, rounded below, glabrous. Flowers pedicelled. Calyx lobes 4, hairy. Stamens 5, inserted on hollows of disc. Drupe somewhat oblique, oblong, tipped by stigmas, 1-seeded, turning red with age.

Western Peninsular India. Common in Ghats, along margins of wet deciduous and semi-evergreen forests. December-August. *CJS* 13033, *HFP* 1529, 1556, 1594.

APOROSA Blume

Flowers dioecious. Calyx generally 4-partite, persistent in female. Petals 0. Disc 0. Stamens 1-5, from the center of flower, with capillary filaments; anthers didynamous. Ovary generally 2-locular; ovules 2 per locule; stigmas 2, 2-fid. Capsule subglobose, 2-4-valved, sometimes bursting irregularly. Seeds oblong, smooth.

Aporosa lindleyana (Wight) Baillon, Etudes Gen. Euph. 645. 1874; Bedd., Fl. Sylv. t. 286. 1872; Gamble, Fl. Madras 1309(916). 1925. *Scepa lindleyana* Wight, Ic. t. 361. 1840.

Trees to 15 m. Stipules ovate, ciliate, deciduous; blade 8-15×2.5-6 cm, oblong-elliptic, glabrous. Calyx lobes 4. Stamens 3-4. Capsule smooth, 3-4-seeded.

Peninsular India, Sri Lanka. Common in Ghats in wet deciduous or semi-evergreen forests. September-May. *CJS* 15835, 16877, *HFP* 1371.

BISCHOFIA Blume

Woody. Leaves long-petiolate, 3-foliolate; leaflets serrate, pinnately veined. Inflorescence paniculate. Flowers dioecious. Calyx 5-lobed, imbricate, cucullate and retuse in male, lanceolate in female. Petals 0. Disc 0. Stamens 5; pistillode peltate on a short stalk. Ovules 2 per locule; styles 3, long. Fruit a 6-8-seeded, indehiscent, hard berry; seeds oblong, trigonous.

Bischofia javanica Blume, Bijd. 1168. 1827; Bedd., Fl. Sylv. t. 259. 1872; Gamble, Fl. Madras 1312(918). 1925. *Microelus roeperianus* Wight & Arn., Edinburgh New Philos. J. 14: 298. 1833; Wight, Ic. t. 1880. 1852.

Tree to 20 m. Leaflets 11-18×4-9 cm, broadly ovate-elliptic, entire, acute, often oblique below. Calyx lobes in male usually enclosing stamens, later reflexed, white; in female greenish. Berry green, smooth.

Indomalaysia, Pacific Islands. Common in Ghats in wet deciduous or semi-evergreen forests, yields a commercial timber. January-August. *CJS* 12372, 16414, *HFP* 1685.

BLACHIA Baillon

Inflorescence of terminal umbellate or racemose male flowers and axillary, solitary or fascicled female flowers, ebracteate. Flowers usually monoecious. Calyx 4-5-lobed; petals in male 5, smaller than sepals, hyaline; in female 0. Disc of scaly glands alternating with petals in male and annular in female. Stamens 10-30, from a central raised receptacle. Ovule 1 per locule; style short; stigmas 3, each dividing into 2 linear arms. Fruit a schizocarp. Seeds oblong.

1 Male flowers in racemes; female flower solitary; calyx accrescent in fruit.....*B. calycina*
1 Male flowers umbelled; female flowers fascicled; calyx not accrescent in fruit.....
.....*B. reflexa*

Blachia calycina Bentham, J. Linn. Soc., Bot. 17: 226. 1880; Gamble, Fl. Madras 1238(936). 1925. *Croton umbellatum* auct. non Willd.: Wight, Ic. t. 1874. 1852.

Small trees to 6 m. Leaves 6-14×2-5.5 cm, elliptic-rhomboid.

Male flowers in racemes. Female flower solitary; calyx lobes accrescent in fruit, oblong, obtuse. Schizocarp to 2×2 cm.

Western Peninsular India. Locally common at Maranahalli (Shiradi Ghat) at margin of semi-evergreen forest. December-March. *CJS* 15803, 16559, *HFP* 1357.

Blachia reflexa Bentham, J. Linn. Soc., Bot. 17: 226. 1880; Gamble, Fl. Madras 1338(936). 1925.

Shrubs to 4 m. Leaves 6-17×3-5 cm, ovate-elliptic. Male flowers in terminal umbels; female flowers axillary, in peduncled fascicles of 3. Calyx lobes persistent but not accrescent. Capsule 1.2 cm across.

Western Peninsular India. Common in Ghats, in undergrowth of semi-evergreen forests near banks of rivers. August-January. *CJS* 11176, 15985, 16945.

BREYNIA J. & G. Forster *nom. cons.*

Flowers sometimes fascicled, monoecious. Perianth 6-lobed; persistent or accrescent in female. Disc none in female, occasionally present in male. Stamens 3; filaments fused. Ovules 2 per locule; styles 3; stigmas bifid. Fruit a schizocarp.

Breynia retusa (Dennst.) Alston, Ann. Roy. Bot. Gard. (Peradeniya) 11: 204. 1929. *Phyllanthus retusus* Dennst., Schluess Hort. Malab. 24. 1818. *Phyllanthus patens* Roxb., Fl. Ind. 3: 667. 1832. *Melanthesa retusa* (Dennst.) Kostel., Allg. Med.-Pharm. Flora 5: 1771. 1835; Sant., Fl. Khandala ed. 3, 245. 1967. *Breynia patens* (Roxb.) Rolfe, J. Bot. 11: 359. 1882; Gamble, Fl. Madras 1304(912). 1925.

Shrubs. Blade to 1.5×1 cm, orbicular, rounded, drying black above, glaucous beneath. Flowers pendulous, brownish-yellow. Perianth turbinate; accrescent in fruit. Disc of thick glands immediately below perianth lobes in male. Ovary depressed. Calyx red in fruit, saucer-like.

India, Sri Lanka. Common in Ghats. January-May. *CJS* 13652, *HFP* 18.

BRIDELIA Willdenow

Woody. Leaves often with parallel main veins. Flowers usually dioecious. Calyx 5-lobed, valvate. Petals 5, free, usually clawed, cucullate and dentate in male, oblong, spathulate and persistent in female. Disc cupular in male, in female usually with an inner corona enclosing ovary. Stamens 5, on a gynandrophore bearing a pistillode at tip. Ovary 2-locular; ovules 2 per locule; styles 2; stigmas deeply 2-fid. Drupe usually globose, enclosing 1-2 usually 1-seeded pyrenes.

1 Erect trees; flowers axillary, clustered ..... *B. crenulata*
1 Scandent shrubs; flowers in interrupted, false spikes ..... *B. scandens*

Bridelia crenulata Roxb., Fl. Ind. 3: 734. 1832. *Bridelia roxburghiana* (Mueller) Gehrm., Bot. Jahrb 41 (Biebl. 95): 30. 1908; Gamble, Fl. Madras 1280(896). 1925. *Bridelia retusa* Sprengel var. *roxburghiana* Mueller in DC., Prodr. 15: 493. 1866.

Small deciduous trees; shoots brown-tomentose. Blade 4-12×2-5 cm, elliptic-oblong, obtuse, subcordate below; main nerves 22-24 pairs, with parallel cross nerves connecting them. Disc reddish. Drupe globose, turning black.

Peninsular India. Common in plains and upper Ghats, chiefly in deciduous forests. March-August. *CJS* 13089, 16848.

Bridelia scandens (Roxb.) Willd., Sp. Pl. 4: 979. 1806; Gamble, Fl. Madras 1281(896). 1925. *Cluytia scandens* Roxb., Pl. Cor. t. 173. 1802.

Scandent shrubs. Leaves 5-14×2.5-7 cm, elliptic, rounded, subcordate below, glabrous; main nerves about 14 pairs, with parallel cross nerves connecting them. Inflorescence an interrupted pseudo-spike by reduction of leaves. Disc without bristles. Drupe globose, turning black.

Western Peninsular India. Common in Ghats, at outskirts of semi-evergreen forests. November-March. *CJS* 15666, 15821, *HFP* 1347.

CHROZOPHORA A. Jussieu *nom. cons.*

Stellately hairy undershrubs. Leaves palmately veined. Calyx 5-lobed; petals 5. Disc obscure, stamens 5-15; filaments all connate below. Ovules 1 per locule; styles 3, dividing into 6 stigmatose lobulate arms. Fruit a schizocarp.

Chrozophora rottleri (Geisler) Sprengel, Syst. 3: 850. 1826; Gamble, Fl. Madras 1317(921). 1925. *Croton rottleri* Geisler, Crot. Monogr. 54. 1807.

Stipules subulate; blade 3-5×1-4.5 cm, ovate-orbicular, rounded-acute, subcordate, sinuate-toothed, scabrous above. Calyx lobes ovate; petals in male obovate, larger than sepals, in female smaller.

Indomalaysia, westward to N. Africa. Fairly common in open country and fallow fields in the plains. January-August. *CJS* 9539, *HFP* 1267.

Note: The combination *Chrozophora rottleri* is sometimes attributed to A. Jussieu (*Tent. Euph.* 28. 1824) but he only cites "*Croton rottleri* Geisler" and suggests it may belong to *Chrozophora*. In other words, Jussieu does not actually make the combination.

CROTON Linnaeus

Note : Many authors consider *Croton* as masculine. However some consider the correct form to be neuter.

Sometimes herbaceous, mostly stellately hairy or scaly. Leaves

crenate-serrate, 3-5-ribbed from base, often glandular at base. Inflorescence terminal, racemose. Calyx usually 5-lobed; petals in male smaller than sepals. Stamens more than 10, on villous receptacle. Ovary usually stellate-hairy or scaly; ovules 1 per locule; styles 3; stigmas bifid. Fruit a schizocarp.

1 Herbs; leaves green below.....*C. bonplandianus*
1 Trees; leaves silvery-white below.....*C. malabaricus*

Croton bonplandianus Baill., Adansonia 4: 339. 1864; Maheswari, Fl. Delhi 315. 1963. *Croton sparsiflorus* Morong, Ann. N. Y. Acad. Sci. 7: 221. 1893; Gamble, Fl. Madras 2: 1316(920). 1925.

Herbs. Blade 2.5-5×1 cm, ovate-lanceolate, serrate. Calyx lobes membranous, obovate in male, in female lanceolate. Petals small in male, 0 in female. Ovary white-scaly. Schizocarp glabrous.

Native of S. America, a weed in the District. Common along roadsides and fallow fields. April-August. *CJS* 9579, 10813.

Croton malabaricus Bedd., Ic. t. 181. 1874; Gamble, Fl. Madras 1314(919). 1925.

Trees to 8 m. Blade 8-12×4-5 cm, ovate-elliptic, entire, silvery-scaly below.

Malabar in South W. India, now Hassan. Rare. Collected only from Kempuhole State Forest in lower Shiradi Ghat, in semi-evergreen forests. We have this only in fruit. August. *HFP* 552.

DRYPETES Vahl

Leaves estipulate, sometimes distantly dentate. Inflorescence of axillary, solitary or clustered flowers. Flowers dioecious, irregular. Calyx 5-lobed, imbricate, inner 2-3 larger. Petals 0. Stamens few-many, inserted around a large disc. Disc annular or saucer shaped, smooth or ribbed, sometimes with reflexed marginal lobes. Ovary generally 2-locular; ovules 2 per locule; style short or elongate; stigmas 2, fleshy, broad, spreading, sometimes connate. Fruit drupaceous with 1-4, 1-seeded pyrenes.

Drypetes oblongifolia (Bedd.) Airy Shaw, Kew Bull. 23: 57. 1969. *Laneasagum oblongifolium* Bedd., Madras J. Sci. n. s. 6: 71. 1861. *Cyclostemon macrophyllus* var. *sessiliflora* Bedd., Fl. Sylv. t. 278. 1872. *Cyclostemon macrophyllus* var. *peninsularis* J. Hooker, Fl. Brit. India 5: 341. 1887. *Cyclostemon macrophyllus* auct. non Blume, 1825: Bourd., For. Trees Trav. 329. 1908; Gamble, Fl. Madras 1302(911). 1925.

Trees to 10 m. Leaves 9-22×4-11 cm, oblong-elliptic, distantly dentate, coriaceous, glabrous. Calyx lobes hairy, yellowish-white.

Ovary villous. Stigmas fleshy, spreading. Drupe to 1.5 cm across, hirsute.

Western Peninsular India. Fairly common in Ghats, in shade of large trees, on the banks of rivers. January-May. *HFP* 77, 1349.

EMBLICA Gaertner

Branchlets distichous. Flowers usually dioecious with many bracts below. Perianth lobes 6, biseriate, scarious-margined. Disc of minute glands, alternating with inner tepals in male, sometimes obscure and 0; in female cupular, lacerate. Stamens 6; filaments columnar. Ovary fleshy, ovules 2 per locule; styles 3, fused below, once-twice-branched, spreading or recurved. Fruit a 6-seeded, globose berry.

1 Leaves more than 1.5×5 cm, less than 50 per branchlet.....*E. fischeri*
1 Leaves less than 1×0.2 cm, more than 100 per branchlet.....*E. officinalis*

Emblica fischeri Gamble, Bull. Misc. Inform. 330. 1925; Fl. Madras 1295(906). 1925.

Trees 4-5 m; branchlets white-hairy when young. Leaf-blade to 1.5× 0.5 cm, less than 50 in a branchlet.

Peninsular India. Rare. Collected once along the cart track leading to temple at Nagpuri, in the hills in the eastern plains. *CJS* 16623.

Emblica officinalis Gaertner, Fruct. 2: 122, t. 108. 1790; Wight, Ic. t. 1896. 1852; Gamble, Fl. Madras 1295(906). 1925.

Tree reaching 6-8 m; branchlets reddish-brown, hairy. Leaf blade to 1×0.2 cm, oblong-elliptic, mucronate at tip. Disc glands minute, sometimes 0. Ovary globose; styles 3, twice branching, spreading.

Paleotropics. Common in western plains and upper Ghats. December-August. *CJS* 16580, *HFP* 2636.

EPIPRINUS Griffith

Flower sometimes irregular. Calyx 4-8-lobed, valvate, equal or unequal; petals 0. Disc 0. Stamens as many as calyx lobes, surrounding a columnar pistillode; anthers dorsifixed, glandular at base. Ovule 1 per locule; style trifid and again branching into 6 stigmatic arms. Fruit a schizocarp; seeds globose.

Epiprinus mallotiformis (Mueller) Croizat, J. Arnold Arbor. 23: 52. 1942. *Symphyllia mallotiformis* Mueller, Linnaea 34: 156. 1865; Gamble, Fl. Madras 1323(925). 1925. *Cephalocroton indicum* Bedd., Fl. Sylv. t. 261. 1872.

Tree to 10 m. Blade 7-14×3.5 cm, elliptic. Calyx in male splitting

into 4, subequal, glabrous lobes, in female 6, unequal, hairy. Stamens 5, inflexed in bud.

Western Peninsular India. Occasional, in lower Bisle Ghat in semi-evergreen forests. October-November. *CJS* 15522, *HFP* 860.

EUPHORBIA Linnaeus

Lactiferous, sometimes succulent. Leaves rarely opposite, sometimes reduced or none. Flowers in cyathia, viz., inflorescences composed of an involucre with a central solitary, stalked female flower surrounded by stalked male flowers each composed of a single jointed stamen; involucre often 4-5-lobed at tip and bearing 1-5 glands alternating with the lobes; glands often with a petaloid limb; bracteoles present. Female flower usually with a calyx-like, 3-lobed structure below ovary; stalk accrescent with age and cernuous. Ovule 1 per locule; styles short or elongated variously connate, each often bifid. Schizocarp 2-3-valved, leaving a persistent central axis; seeds ribbed.

1 Plants succulent, growing well over 1 m tall.
2 Plants unarmed; stems less than 1 cm thick.....*E. tirucalli*
2 Plants armed; stems over 2 cm thick.
3 Stems sinuately winged.....*E. antiquorum*
3 Stems terete.....*E. nivulia*
1 Plants not succulent, rarely to 1 m tall.
4 Cyathia long-stalked, terminal.....*E. laeta*
4 Cyathia subsessile, axillary.
5 Cocci winged.....*E. notoptera*
5 Cocci not winged.
6 Limb of gland laciniate; leaves opposite.
7 Limb pilose; floral leaves crowded.....*E. cristata*
7 Limb glabrous.....*E. laciniata*
6 Limb of gland not laciniate; leaves alternate.
8 Prostrate herbs.
9 Plant glabrous throughout.....*E. heyneana*
9 Plant hairy.....*E. thymifolia*
8 Procumbent herbs.....*E. hirta*

Euphorbia antiquorum L., Sp. Pl. 450. 1753; Wight, Ic. t. 897. 1844-45; Gamble, Fl. Madras 1277(894). 1925.

Succulents to 5 m. Stems 3-4-winged, bearing sharp spines. Leaves 0. Stamens red.

Indomalaysia. Common in hills in the plains and in scrub. November-January. *CJS* 11514, 12008.

Euphorbia cristata Heyne ex Roth, Nov. Pl. Sp. 226. 1821; Gamble, Fl. Madras 1274(892). 1925. *Chamaesyce cristata* (Roth) Webster, J. Arnold Arbor. 48: 424. 1967.

Procumbent herbs. Leaves opposite, to 2×1 cm, oblong, acute, obliquely cordate, serrulate, hairy. Floral (upper) leaves imbricate, subtending a head of cyathia. Limb of gland laciniate, pilose, pink.

Central & Peninsular India, Sri Lanka. Fairly common, in open country, on sandy-gravelly soil in the eastern plains, in and around Arsikere. November-December. *CJS* 11921.

Euphorbia hirta L., Sp. Pl. 454. 1753; Gamble, Fl. Madras 1275(892). 1925. *Chamaesyce hirta* (L.) Millspaugh, Publ. Field Mus. Nat. Hist., Bot. ser. 2: 303. 1909.

Procumbent herbs; stem clothed with yellowish hairs. Leaves 2-4×0.6-1.5 cm, elliptic, acute, oblique, serrulate, hairy. Cyathia axillary, in capitate cymes. Limb of gland minute. Cocci trigonous.

Pantropical. Common along roadsides, in open country. All seasons. *CJS* 14538, 14781.

Euphorbia laciniata Ramam. *nom. nov. Euphorbia fimbriata* Heyne ex Roth, Nov. Pl. Sp. 227. 1821, non Scopoli. 1788; Gamble, Fl. Madras 1274(891). 1925. *Euphorbia fimbriata* var. *laxa* Boiss. in DC., Prodr. 15(2): 19. 1862. *Euphorbia cristata* var. *major* Roth, Nov. Pl. Sp. 226. 1821. *Chamaesyce fimbriata* (Roth) Raghavendra & Razi, J. Mysore Univ. n.s., Sect. B. 23: 53. 1970.

Procumbent herbs. Leaves opposite, to 1×0.6 cm, oblong, rounded, obliquely cordate, serrulate, glabrous; floral leaves not imbricate. Cyathium usually single, axillary. Limb of gland laciniate, glabrous, white or pink.

Central & Peninsular India, Sri Lanka. Common in the eastern plains, along roadsides and in open country. September-March. *CJS* 15552, 16313.

Euphorbia laeta Heyne ex Roth, Nov. Pl. Sp. 230. 1821; Rau, Bull. Bot. Surv. India 19 (Suppl.): 71. 1969. *Euphorbia rothiana* Sprengel, Syst. 3: 796. 1826; Wight, Ic. t. 1864. 1852; Gamble, Fl. Madras 1278(894). 1925.

Erect herbs. Leaves 4-11×0.1-1 cm, oblanceolate, acute, cuneate; floral leaves whorled, sessile, elliptic, acute at both ends. Inflorescence terminal, each dichotomously branching. Involucral mouth villous; gland transversely oblong, 2-horned.

Central & Peninsular India, Sri Lanka. Rare. Collected once in shade, in wet deciduous forest, bordering cardamom estates. February. *HFP* 2628.

Euphorbia nivulia Ham., Trans. Linn. Soc. London 14: 286. 1825; Wight, Ic. t. 1862. 1852; Gamble, Fl. Madras 1277(893). 1925.

Tall succulents. Stem terete, nodes with a pair of spines on flat

corky bases. Leaves caducous, 11-26 × 5-8 cm, obovate, retuse, fleshy.

Drier parts of India, Java. Common on rocky terrain, sometimes along hedges in plains. January-July. *CJS* 16436, *HFP* 1279.

Euphorbia heyneana Sprengel, Syst. Veg. 3: 791. 1826; Panigrahi, Kew Bull. 29: 695. 1974. *Euphorbia microphylla* Heyne ex Roth, Nov. Pl. Sp. 229. 1821, non Lam., 1788; Gamble, Fl. Madras 1272 (890). 1925.

Prostrate, glabrous herbs. Internodes of stem ribbed. Stipules laciniate. Leaves opposite, rounded, obliqueat base, serrul ate, 0.8 cm long. Cyathia reddish.

Indomalaysia. Common in plains and Ghats, along roadsides and open country. April-September. *CJS* 11378.

Euphorbia notoptera Boiss. in DC., Prodr. 15(2): 26. 1862; Gamble, Fl. Madras 1275(892). 1925.

Herbs. Leaves alternate below, opposite above; petiole 3-3.5 cm; blade 5-9 × 4-5 cm, elliptic, acute, cuneate. Cyathia 1-3 together. Glands transversely oblong; limb repand. Cocci 2-3-winged.

Western Peninsular India. Common as a weed in and around cultivated fields. May-August. *CJS* 8829, 13563.

Euphorbia thymifolia L., Sp. Pl. 454. 1753; Gamble, Fl. Madras 1276(893). 1925. *Chamaesyce thymifolia* (L.) Millspaugh, Publ. Field Mus. Nat. Hist., Bot. ser. 2: 412. 1909.

Prostrate herbs; stem hairy. Leaves to 0.6 × 0.4 cm, oblong, rounded and mucronate at tip, oblique and rounded at base, serrulate, sparsely hairy. Cyathia usually solitary, axillary, appressed-hairy; gland minute, shortly stipitate; limb 0.

Tropics. Common along roadsides and in open country. April-October. *CJS* 15339, *HFP* 1770.

Euphorbia tirucalli L., Sp. Pl. 452. 1753; Gamble, Fl. Madras 1276 (893). 1925.

Tall succulents with terete branches. Leaves scaly, caducous.

A native of Africa, naturalizing in Hassan. Presently mostly along hedges near Channarayapatna. January. *CJS* 12393.

* * *

Euphorbia pulcherrima Willd. ex Klotzsch is an ornamental with large, showy, scarlet bracts.

EXCOECARIA Linnaeus

Lactiferous. Leaves sometimes opposite, entire or distantly crenate-

serrate. Male flowers 1-3, clustered; female flowers solitary. Bracts and bracteoles present, the former partly hiding flowers, the latter subtending them; rachis usually glandular below the bracts. Calyx 3-lobed, imbricate; petals 0. Disc 0. Stamens 3, free with basally dilated filaments. Pistillode 0. Ovule 1 per locule; styles 3, shortly connate, apically diverging and recurved. Schizocarp fleshy, usually lobed.

Excoecaria crenulata Wight, Ic. t. 1865. 1852; Gamble, Fl. Madras 1345(941). 1925. *Excoecaria robusta* J. Hooker, Fl. Brit. India 5: 473. 1888; Gamble, Fl. Madras 1345(941). 1925.

Shrubs or small trees; stem flattened. Leaves opposite; petiole 1.5-2 cm long; blade 10-25 × 3.5-5 cm, oblong-lanceolate, rounded-oblique at base, entire-serrate. Inflorescences usually unisexual, male elongate, female short.

Western Peninsular India, Sri Lanka. Common in upper Ghats, at outskirts of wet deciduous forests. March-August. *CJS* 13642, 16851, *HFP* 571.

Note: *Excoecaria robusta* J. Hooker appears to be only a more robust form of *E. crenulata* Wight.

FAHRENHEITIA Reichenbach & Zollinger

Petiole biglandular at apex. Inflorescence pendulous, elongate. Male flowers in fascicles; female solitary. Calyx lobes 5, unequal; petals 5. Disc lobed or annular, villous. Stamens usually many and columnar. Ovule 1 per locule; style short, branches bifid. Fruit a schizocarp.

Fahrenheitia zeylanica (Thwaites) Airy Shaw, Kew Bull. 20: 410. 1966. *Desmostemon zeylanicus* Thwaites, Enum. 278. 1861. *Ostodes zeylanicus* (Thwaites) Mueller, Linnaea 34: 214. 1865; Gamble, Fl. Madras 1336(934). 1925.

Lofty evergreen trees. Blade 11-32 × 5-10 cm, oblong-oblanceolate, shallowly serrate. Racemes dioecious. Calyx lobes orbicular, thick, dorsally corniculate. Petals larger, oblong, yellow. Stamens 20. Ovary villous. Schizocarp brown-stellate-tomentose.

Western Peninsular India, Sri Lanka. Common in Ghats in semi-evergreen forests. March-May. *CJS* 13417, 16817.

Note: The female racemes persist and flower during the next season.

GIVOTIA Griffith

Leaves estipulate, dentate, palmately veined. Flowers dioecious. Calyx lobes 5; petals 5, longer than calyx, cohering into a campanulate corolla. Disc glandular in male, cupular in female flowers. Stamens 15-25, on

a villous receptacle. Ovary 2-3-locular; ovule 1 per locule; style short, branches 2-fid. Drupe subglobose, with a globose or ellipsoid seed.

Givotia rottleriformis Griff., Calcutta J. Nat. Hist. 4: 388. 1844; Bedd., Fl. Sylv. t. 285. 1873; Gamble, Fl. Madras 1342(938). 1925; Smith, Kew Bull. 22: 504. 1968.

Deciduous, stellate-pubescent tree to 8 m. Petiole usually with 1-2 black glands; blade 3-5×2.5-5.6 cm, ovate-orbicular, acute, cordate, coarsely toothed, 5-ribbed. Calyx lobes obovate, densely stellately pubescent; petals obovate, glabrous.

Central & Peninsular India. Locally common in the hills in eastern plains. April. *HFP* 2684.

GLOCHIDION J. & G. Forster *nom. cons.*

Inflorescence of axillary clusters. Flowers monoecious. Perianth 5-6-lobed, nearly free, usually biseriate in male, 5-6-cleft or irregularly dentate in female. Disc 0. Stamens 3-8; anthers connate in a column. Ovary 3-15-locular; ovules 2 per locule; styles connate, branches often bifid. Fruit a schizocarp.

1 Twigs and leaves glabrous.
2 Stipules erect; stamens 3; schizocarp sessile; leaves membranous.....*G. ellipticum*
2 Stipules deflexed; stamens 6; schizocarp shortly stalked; leaves chartaceous.....*G. zeylanicum*
1 Twigs and leaves pubescent.
3 Stamens 5; schizocarp acute at apex.....*G. tomentosum*
3 Stamens 3; schizocarp depressed at apex.....*G. johnstonei*

Glochidion ellipticum Wight, Ic. t. 1906. 1852; Gamble, Fl. Madras 1308(915). 1925.

Trees to 14 m. Blade ovate, membranous. Male flowers pedicelled; perianth lobes 6, biseriate; stamens 3. Female flowers subsessile, 5-locular. Schizocarp depressed at tip.

Western Peninsular India, from Bababudans to Coorg. Common in upper Ghats, along edges of wet deciduous forests, sometimes in open country. September-March. *CJS* 16344, *HFP* 1315.

Glochidion johnstonei J. Hooker, Fl. Brit. India 5: 314. 1888; Gamble, Fl. Madras 1307(914). 1925.

Small trees; branches pubescent. Blade 6-12×3.5-5 cm, oblong-elliptic, acute, hairy on both sides. Flowers pedicelled. Perianth lobes 6, biseriate. Stamens 3. Ovary 5-locular. Schizocarp stalked, depressed at tip, hairy.

Western Peninsular India. Occasional in Ghats. April-August. *CJS* 13251, 13988.

Glochidion tomentosum Dalzell, Hooker's J. Bot. Kew Gard. Misc. 3: 38. 1851; Gamble, Fl. Madras 1306(914). 1925.

Trees to 10 m; branches pubescent. Stipules ovate, erect; blade 4.5-10×2.5-4.5 cm, oblong-elliptic, sometimes ovate-lanceolate, acute, oblique, hairy. Flowers pedicelled. Perianth lobes 6, biseriate. Stamens 5. Ovary 5-locular. Schizocarp beaked at tip.

Western Peninsular India. Fairly common in upper Ghats and western plains, along edges of wet deciduous forests. January-May. *CJS* 9810, 12440.

Glochidion zeylanicum (Gaertner) A. Juss., Tent. Euph. 107, t. 3. 1824; Gamble, Fl. Madras 1306(914). 1925. *Bridelia zeylanica* Gaertner, Fruct. 2: 128, t. 109. 1790.

Trees to 10 m. Stipules subulate, deflexed; blade 6-17×5-7 cm, ovate-lanceolate. Flowers pedicelled. Perianth lobes 6, biseriate. Stamens 6. Ovary 6-locular. Schizocarp depressed at tip.

Indomalaysia. Fairly, common in western plains and upper Ghats in wet deciduous forests. May-September. *CJS* 9050, *HFP* 1730.

HOMONOIA Loureiro

Flowers usually dioecious, subtended by a bract and 2-bracteoles. Perianth in male 3-lobed, valvate, in female 5-8-lobed, imbricate. Disc 0. Stamens numerous, in paniculate fascicles, the whole connate below. Ovule 1 per locule; stigmas 3, sessile, laciniate, recurved. Fruit a schizocarp.

Homonoia riparia Lour., Fl. Cochinch. 637. 1790; Gamble, Fl. Madras 1333(932). 1925. *Adelia nereifolia* Roth, Nov. Pl. Sp. 375. 1821; Wight, Ic. t. 1868. 1852.

Small trees; shoots pubescent. Blade 10-20×1.5-3 cm, linear-lanceolate, acute, cuneate, with many orbicular, yellowish scales beneath. Male flowers stalked, female sessile. Perianth lobes ovate, pink in male; in female 5-lobed, ovate, brown. Ovary tomentose.

Indomalaysia. A typical rheophyte, it is common amongst boulders in river beds, in Ghats; usually remains submerged in monsoon. January-May. *CJS* 12591, 13295, *HFP* 48.

JATROPHA Linnaeus

Leaves palmately lobed, palmately veined. Inflorescence cymose, of axillary corymbs, usually monoecious with female flowers in forks of cyme. Calyx 5, nearly free; petals 5, usually larger than calyx, recurved. Disc of free glands, sometimes united, opposite petals. Stamens many,

outer usually shorter, subconnate. Ovule 1 per locule; style branches 2-fid. Fruit a schizocarp or drupaceous. Seeds ellipsoid, generally carunculate.

Jatropha curcas L., Sp. Pl. 1006. 1753; Gamble, Fl. Madras 1340 (937). 1925.

Shrub with bark peeling off in thin white flakes. Blade ovate, acute, cordate, shallowly 3-7-lobed. Petals yellow, hairy on the inside near middle. Stamens 10.

A native of Tropical America. Commonly grown as a hedge plant in the District. May-August. *CJS* 10815, 13706.

KIRGANELIA A. Jussieu

Inflorescence of axillary fascicles, usually monoecious. Perianth 5-lobed, unequal. Disc fleshy, of large glands. Stamens 5, the outer 2 smaller, the inner connate. Ovary 5-12-locular; ovules 2 per locule, superposed; styles minute, sometimes bifid.

Kirganelia reticulata (Poiret) Baillon, Etudes Gen. Euph. 614. 1874; Gamble, Fl. Madras 1294(905). 1925. *Phyllanthus reticulatus* Poiret in Lam., Encycl. 5: 298. 1804.

Pubescent stragglers. Leaves to 2×0.6 cm, elliptic-orbicular, rounded at both ends, glabrescent. Perianth lobes oblong, scarious-margined; outer 2 larger, inner 3 smaller. Staminal filaments fleshy. Ovary globose, 5-locular, 10-ribbed; stigmas sessile.

Paleotropics. Common in plains, usually in scrub jungles. September-April. *CJS* 9504, 10802, 15177.

MACARANGA Du Petit-Thouars

Leaves usually peltate, palmately veined, usually gland-dotted below. Flowers usually dioecious; males minute, clustered and concealed by bracts; female 1-few per bract; bracts often large. Perianth 2-5-lobed. Disc 0. Stamens 1-many, free; anthers 2-4-celled. Ovary 2-6-locular; ovule 1 per locule; styles unbranched or branching. Fruit a schizocarp or loculicidal capsule, usually muricate.

Macaranga peltata (Roxb.) Mueller in DC., Prodr. 15(2): 1010. 1866; Gamble, Fl. Madras 1326(928). 1925. *Osyris peltata* Roxb., Fl. Ind. 3: 855. 1832. *Mappa peltata* (Roxb.) Wight, Ic. t. 817. 1844.

Trees to 20 m. Petiole to 17 cm long; blade to 32×18 cm, orbicular, acute, entire, red-glandular beneath, brown-pubescent when young. Inflorescence paniculate. Calyx pubescent, splitting into 2-3 lobes in

male, 2-lobed in female. Stamens 2-3. Ovary globose, 2-locular; styles deciduous. Capsule glandular.

Peninsular India, Sri Lanka. Common in Ghats along roadsides and forest clearings. October-April *CJS* 12953, *HFP* 1497, 2728.

MALLOTUS Loureiro

Stellately hairy. Leaves rarely opposite, blade sometimes peltate, usually serrate or shortly incised, usually palmately veined. Flowers usually dioecious; male flowers fascicled; female flowers solitary. Perianth lobes generally 4, valvate. Disc 0. Stamens many; anthers usually versatile. Ovary generally 3-locular; ovule 1 per locule; styles shortly connate, papillose within, pubescent without. Fruit a 3-4-valved capsule or schizocarp, often muricate or glandular, sometimes papillose. Seeds smooth.

1 Leaves opposite, pinnately veined ..... *M. resinosus*
1 Leaves alternate, spiralled, palmately veined.
2 Leaf blade peltate ..... *M. tetracoccus*
2 Leaf blade not peltate ..... *M. philippensis*

Mallotus philippensis (Lam.) Mueller, Linnaea 34: 196. 1865; Bedd., Fl. Sylv. t. 289. 1873; Gamble, Fl. Madras 1322(924). 1925 ('*philippinensis*'). *Croton philippense* Lam., Encycl. 2: 206. 1786.

Trees to 20 m. Blade 8-19×3-10 cm, ovate-elliptic, acute-acuminate, cuneate, glaucous and red-glandular beneath, sinuately toothed. Inflorescence of axillary racemes. Stamens many. Capsule globose, covered with red powder.

China, Indomalaysia to Australia. Common in western plains and Ghats, rarely in eastern plains (near temple at Nagpuri), in deciduous and semi-evergreen forests. August-January. *CJS* 14462, 15651, *HFP* 1273.

Note: Some authors have adopted the spelling, '*philippinensis*' referring to the Philippine Islands. Lamarck however, uses the epithet, '*philippense*' while calling the plant 'Croton des philippines'.

Mallotus resinosus (Blanco) Merrill, Sp. Blancoanae 222. 1918. *Adelia resinosa* Blanco, Fl. Filip. ed. 2, 562. 1845. *Claoxylon muricatum* Wight, Ic. t. 1886. 1852. *Mallotus muricatus* (Wight) Mueller, Linnaea 34: 191. 1865.

Leaves opposite, decussate. Blade 6-24×3-8.5 cm, elliptic-rhomboid, acute, cuneate, rounded at tip, narrowed below, sinuately toothed, pinnately veined. Perianth lobes oblong, reflexed. Stamens many. Pistillate flowers remote; capsule covered with muricate or echinate processes, stellately hairy on the inside.

Western Peninsular India. Common in Ghats, usually in shade of

large trees along banks of streams. May-October. *CJS* 11244, 14204, *HFP* 381.

Mallotus tetracoccus (Roxb.) Kurz, J. Asiat. Soc. Bengal 16: 245. 1873. Croizat, J. Arnold Arbor. 21: 503. 1940. *Rottlera tetracocca* Roxb., Fl. Ind. 3: 827. 1832. *Mallotus albus* sensu Mueller, Linnaea 34: 188. 1865, excluding basionym. *Mallotus albus* var. *occidentalis* J. Hooker, Fl. Brit. India 5: 429. 1887; Gamble, Fl. Madras 1321 (924). 1925. *Rottlera peltata* Wight, Ic. t. 1873. 1852.

Tree to 20 m. Petiole 4-15 cm long; blade peltate, 5-21 × 7-20 cm, ovate, sinuate below, palmately 5-ribbed, drying brown beneath. Perianth lobes acute. Stamens many. Ovary 4-locular. Capsule 3-4-valved, white-ferruginous, papillose. Seeds black, smooth.

India, Burma. Common in wet deciduous to semi-evergreen forests, in Ghats. All seasons. *CJS* 15092, 15575, 16040.

Note: When Mueller established *Mallotus albus* he included *Rottlera alba* Roxb. from Penang and *R. tetracocca* (from Sylhet). According to Croizat (*l.c.*) the Malayan *R. alba* is *Mallotus paniculatus* (Lam.) Mueller and the correct binomial for the Indian taxon is *M. tetracoccus.*

MANIHOT Miller

Lactiferous. Leaves palmately 3-5-lobed and -ribbed. Inflorescence monoecious, with lowest few long-pedicelled ones female; males above on shorter pedicels. Perianth 5-lobed; petals 0. Disc fleshy, 10-lobed. Stamens 10, between disc lobes, biseriate with the inner smaller. Ovary 6-ribbed; ovule 1 per locule; styles 3; stigmas broad. Fruit a schizocarp.

Manihot glaziovii Mueller in Martius, Fl. Bras. 11(2): 446. 1873; Gamble, Fl. Madras 1346(942). 1925.

Small trees. Blade peltate, 3-5-lobed; lobes elliptic-oblong, glaucous beneath. Flowers greenish to light red.

Brazil. Introduced and grown chiefly for a low quality rubber—Ceara rubber. An escape in upper Ghats. September-January. *CJS* 12236, *HFP* 201.

MARGARITARIA Linnaeus f.

Flowers fascicled, usually dioecious. Perianth lobes 4, outer 2 larger; petals 0. Disc 0. Stamens 4; pistillode clavate. Ovules 2 per locule; styles short, 2-fid. Fruit a capsule.

Margaritaria indica (Dalzell) Airy Shaw, Kew Bull. 20: 387. 1966. *Prosorus indicus* Dalzell, Hooker's J. Bot. Kew Gard. Misc. 4: 346. 1852; Gamble, Fl. Madras 1294(905). 1925.

Large trees. Blade 5-12 × 3-7 cm, broadly elliptic, glaucous beneath, membranous. Capsule on a long, slender stalk, turning brown.

Western Peninsular India, Sri Lanka. Fairly common in Ghats in wet deciduous and semi-evergreen forests. April-May. *CJS* 13263, 16771, *HFP* 80.

PHYLLANTHUS Linnaeus *emend.* Gaertner

Leaves distichous on branches. Flowers sometimes dioecious. Perianth lobes 4-6, biseriate, persistent in female flower. Disc of free glands or cupular. Stamens usually 3, free or connate. Anthers transversally dehiscent. Ovules 2 per locule; styles usually 3, bifid. Fruit capsular, loculicidally dehiscent, or breaking into cocci, rarely a drupe.

1 Capsule verrucose.....*P. urinaria*
1 Capsule smooth.
2 Stamens free.....*P. gardnerianus*
2 Stamens fused.
3 Stipules not peltate.....*P. fraternus*
3 Stipules peltate.
4 Stipules red-brown, sagittate at base; leaves oblong, rounded, not cuneate at base .....*P. virgatus*
4 Stipules scarious, whitish; leaves obovate, cuneate.....*P. maderaspatensis*

Phyllanthus fraternus Webster, Contr. Gray. Herb. 176: 53. 1955. *Phyllanthus niruri* auct. non L.: J. Hooker, Fl. Brit. India 5: 298. 1887; Gamble, Fl. Madras 1290(903). 1925; Wight, Ic. t. 1894. 1852.

Herbs. Stipules lanceolate, acuminate, basally attached; leaf-blade to 0.8 × 0.4 cm, oblong-elliptic, rounded, subcordate. Flower solitary, 5-merous. Stamens fused. Seeds minutely tubercled in concentric lines.

Tropics except Australia. Occasional; collected once along roadsides near Mallipatna. July. *HFP* 271.

Phyllanthus gardnerianus (Wight) Baillon, Etudes Gen. Euphorb. 628. 1858, Fl. Madras 1290(902). 1925. *Macraea gardneriana* Wight, Ic. t. 1902, f. 3. 1852.

Undershrubs. Stipules hyaline, scarious, peltate. Leaves 1.5-3.5 × 0.5-1.5 cm, oblong-elliptic, rounded, acute, glaucous beneath; those bearing flowers in axils smaller in size. Flowers fascicled or solitary. Perianth lobes 6. Stamens free. Capsule smooth; seeds minutely tubercled.

Peninsular India, Sri Lanka. Common in Ghats, along roadsides. July-October. *CJS* 10770, 11211, 15485.

Note: This may be the same taxon as *P. Macraei* Mueller.

Phyllanthus maderaspatensis L., Sp. Pl. 982. 1753; Wight, Ic. t. 1895, f. 3. 1852; Gamble, Fl. Madras 1289(902). 1925.

Herbs. Stipules scarious, peltate; leaf-blade to 2.8×0.4 cm, obovate, glaucous beneath. Flowers fascicled, solitary. Perianth lobes 5. Stamens fused. Capsule smooth; seeds transversely lineolate.

Paleotropics. Common in eastern plains in open country and in fields of *Sorghum.* July-October. *CJS* 11937, 13560.

Phyllanthus urinaria L., Sp. Pl. 982. 1753; Gamble, Fl. Madras 1289(902). 1925. *Phyllanthus leprocarpus* Wight, Ic. t. 1895, f. 4. 1852.

Herbs. Stipules small; leaf-blade to 1.5×0.4 cm, oblong-elliptic, mucronate, rounded; margin generally glabrous, often purple. Inflorescence of fascicles of pedicellate male flowers and solitary, sessile female flowers. Perianth lobes 5. Stamens fused. Capsule verrucose; seeds transversely ridged.

Tropics. Common in Ghats, in shade along edges of semi-evergreen forests, often along banks of streams. May-September. *CJS* 14780, *HFP* 322.

Phyllanthus virgatus Forst. f., Fl. Ins. Austr. Prodr. 65. 1786; Backer & Bakh. f., Fl. Java 1: 469. 1963. *Phyllanthus simplex* Retz., Obs. Bot. 5: 29. 1788; Gamble, Fl. Madras 1289(902). 1925. *Macraea oblongifolia* Wight, Ic. t. 1902, f. 1. 1852.

Herbs. Stipules ovate, sagittate, reddish-brown; leaf-blade to 1.6×0.3 cm, linear-oblong, mucronate, glaucous beneath. Perianth lobes 6. Stamens nearly free. Capsule usually more than 1 per axil, long-stalked, smooth. Seeds red-tubercled.

South Asia to Pacific Islands. Common in plains along roadsides and in open country. June-December. *CJS* 17921, *HFP* 1832.

RICINUS Linnaeus

Leaves peltate, palmatifid, serrate, palmately veined. Perianth 3-5-partite, valvate. Disc 0. Stamens numerous, in many-branched fascicles. Ovary usually densely muricate, ovule 1 per locule; styles 3, branching into 6 papillose arms. Schizocarp densely muricate.

Ricinus communis L., Sp. Pl. 1007. 1753; Gamble, Fl. Madras 1335 (933). 1925.

Large shrubs, usually glaucous. Petiole biglandular at tip, blade 7-15×7-15 cm, palmately 7-fid. Male perianth 3-partite, female 5.

Probably indigenous to Africa, cultivated in the Tropics. Cultivated as source of oil, sometimes an escape in plains and Ghats. January. *CJS* 12370, 12574.

SEBASTIANIA Sprengel

Bracts glandular. Calyx 3-partite, narrower in male; petals 0. Disc absent. Stamens 3; filaments connate or not. Ovary 3-lobed, each lobe with 2 series of acute, warty out-growths on the dorsal side; ovule 1 per locule; styles connate below, recurved. Schizocarp with warts.

Sebastiania chamaelea (L.) Mueller in DC., Prodr. 15(2): 1175. 1866; Gamble, Fl. Madras 1344(940). 1925. *Tragia chamaelea* L., Sp. Pl. 1391. 1753.

Herbs, woody at base. Stipules ovate, fimbriate; blade 4-6×0.3-0.5 cm, linear-oblong, minutely serrate, glabrous. Calyx lobes usually fimbriate. Warty outgrowths on the schizocarp red.

Paleotropics. Fairly common in the plains and in hills in plains. August-November. *CJS* 14703, *HFP* 1072.

SECURINEGA Commerson ex A. Jussieu *nom. cons.*

Woody. Perianth lobes 5. Petals 0. Disc 0. Stamens usually 5, free. Usually with 2-3-fid pistillode. Ovules 2 per locule; styles 3, shortly connate below, once or twice branched, usually spreading. Fruit drupaceous.

1 Armed plants; leaves to 1.5×0.8 cm.....*S. leucopyrus*
1 Unarmed plants; leaves to 2.5×1.5 cm.....*S. virosa*

Securinega leucopyrus (Willd.) Mueller in DC., Prodr. 15(2): 451. 1866. *Fluggea leucopyrus* Willd., Sp. Pl. 4: 757. 1806; Wight, Ic. t. 1875. 1852; Gamble, Fl. Madras 1296(907). 1925.

Deciduous shrubs. Branchlets stout, spine-like, bearing flowers and leaves. Leaves to 1.5×0.8 cm, elliptic to obovate, emarginate. Fruits fleshy turning white with age.

India, Burma, Sri Lanka. Fairly common in scrub in plains. Fruiting June-August. *CJS* 13842, 14082, 14362.

Securinega virosa (Willd.) Baillon, Adansonia 6: 334. 1865-66; Pax & Hoffm. in Engl. & Prantl, Pflanzenfam. ed. 2. 19c: 60. 1931. *Phyllanthus virosus* Roxb. ex Willd., Sp. Pl. 4: 578. 1805. *Fluggea virosa* (Willd.) Baillon, Etud. Gen. Euph. 593. 1858; Gamble, Fl. Madras 1296(907). 1925.

Deciduous shrubs. Branchlets slender. Leaves to 2.5×1.5 cm, obovate, emarginate. Flowers white. Fruits fleshy, turning white with age.

Paleotropics. Common in plains and upper Ghats. April-August. *CJS* 10789, 13523, *HFP* 91.

Note: Doubts have been expressed about the distinctiveness of this species from the preceding one. Santapau (*Fl. Khandala* ed. 3, 244. 1967) feels that they should be merged.

SYNOSTEMON F. v. Mueller

Herbs. Leaves distichous, fleshy. Inflorescence of fascicles of male flowers in the lower axils of young shoots; solitary or binate female flowers in the upper axils. Perianth 6-lobed, seemingly biseriate. Disc well developed and 6-lobed in male, with the lobes opposite and adnate to perianth lobes, none in female. Stamens 3, in center of disc; filaments short, connate; anther cells dehiscing transversely. Ovary obconical, truncate; ovules 2 per locule; styles short, 2-branched. Fruit a schizocarp; seeds tuberculate, ventrally channeled.

Synostemon bacciforme (L.) Webster, Taxon 9: 26. 1960. *Phyllanthus bacciformis* L., Syst. Nat. ed. 13, 707. 1774. *Agyneja bacciformis* (L.) A. Juss., Tent. Euph. 24. 1812; Wight, Ic. t. 1893. 1852; Gamble, Fl. Madras 1284(899). 1925.

Herb with stout rootstock and straggling 4-angled branches. Leaves to 2×1 cm, obovate, mucronate at tip. Tepals glandular, with scarious margin, rounded and crenulate at tip in male, acute to acuminate in female. Seeds white.

Indomalaysia. Rare. Collected once at Goudagere in plains. August-September. *CJS* 10803.

TRAGIA Linnaeus

Usually twining herbs with hispid stinging hairs. Leaves crenate-serrate, palmately veined. Perianth usually 3-lobed, valvate in male; 3-partite, usually pinnatifid and accrescent in female. Disc 0. Stamens generally 3, free or connate. Ovary usually hirsute; ovule 1 per locule; style elongate, 3-branched. Fruit a schizocarp with an accrescent, spreading calyx.

1 Leaves cordate at base..... *T. hispida*
1 Leaves acute at base..... *T. involucrata*

Tragia hispida Willd., Sp. Pl. 4: 323. 1805; Gamble, Fl. Madras 1332(932). 1925.

A trailing or twining herb. Petiole to 7 cm long; blade 4-12×3-5 cm, ovate, acuminate, cordate, serrate. Perianth lobes hairy in female.

Western Peninsular India. Common in Ghats, in thickets, occasionally a trailer on ground. All seasons. *CJS* 12255, *HFP* 987.

Tragia involucrata L., Sp. Pl. 980. 1753; Gamble, Fl. Madras 1332 (931). 1925.

Erect, trailing or straggling herbs. Petiole to 1 cm long; blade 5-12×1-5 cm, linear-elliptic, entire or crenate-serrate.

Peninsular India. Common in plains and hills in the eastern part. October-May. *CJS* 9203.

TREWIA Linnaeus

Trees. Leaves usually opposite, palmately veined. Inflorescence dioecious. Perianth lobes 5, coherent, valvate. Disc 0. Stamens many, free, on a raised receptacle. Ovule 1 per locule; stigmas 3, plumose, deciduous. Fruit drupaceous.

Trewia nudiflora L., Sp. Pl. 1193. 1753 ('*Trevia*'); Gamble, Fl. Madras 1319(922). 1925.

Deciduous tree to 12 m. Blade 8-10×6-14, broadly ovate, cordate-acute 3-ribbed, glabrous. Fruit to 2×2 cm.

Indomalaysia. Common in lower Shiradi Ghat at Kempuhole, occasional in Bisle Ghat, in wet deciduous to semi-evergreen forests. January-May. *CJS* 13163, 16206, *HFP* 1699.

Note: *Trewia polycarpa* Bentham may not be distinct from this.

* * *

Manihot esculenta Crantz (*M. utilissima* Pohl) is cultivated for its starchy roots (Tapioca). *Pedilanthus tithymaloides* (L.) Poit. with red flowers is sometimes grown as an ornamental. *Synadenium grantii* J. Hooker is a large shrub used in hedges. Although common it has not been found to be naturalizing.

87. RHAMNACEAE

T. P. Ramamoorthy

Trees or erect to climbing shrubs. Leaves usually alternate; stipules deciduous, sometimes spiny; blade simple, entire-crenate, pinnately or palmately veined. Flowers usually bisexual, regular, bracteate, usually 5-merous. Calyx lobed, valvate; petals smaller, usually clawed and cucullate, free, sometimes 0. Stamens opposite petals. Disc fleshy, entire or lobed. Ovary superior-inferior, usually 3-locular; ovule 1 per locule, basal; styles as many as locules. Fruit a 1-2-pyrened drupe, sometimes capsular.

1 Plants with tendrils; flowers unisexual; ovary inferior.....**Gouania**
1 Plants without tendrils; flowers bisexual; ovary superior (often surrounded by disc).

2 Leaves palmately veined.....**Ziziphus**
2 Leaves pinnately veined.
3 Plants armed.....**Scutia**
3 Plants unarmed.
4 Styles 2, persisting to form a wing on fruit.....**Ventilago**
4 Styles 3, deciduous; fruit not winged.....**Sageretia**

GOUANIA Linnaeus

Unarmed, climbing tendriled shrubs. Leaves crenate, usually pinnately veined. Inflorescence of interrupted spikes. Flowers unisexual. Disc often with horn-like appendages, alternating with stamens. Ovary inferior. Fruit coriaceous with 3 longitudinal wings, finally breaking into 3 cocci.

Gouania microcarpa DC., Prodr. 2: 40. 1825; Gamble, Fl. Madras 225(161). 1918.

Petiole ferruginous; blade to 8×4 cm, ovate-elliptic, acuminate, subcordate-truncate below. Calyx densely tomentose; petals white, cucullate. Capsule tipped by persistent calyx.

Western Peninsular India, Sri Lanka. Common in Bisle Ghat, often along margins of wet deciduous or semi-evergreen forests. October-March. *CJS* 16251, *HFP* 1225.

SAGERETIA Brongniart

Glabrous shrubs. Leaves opposite, crenate, pinnately veined. Inflorescence axillary or terminal, of interrupted spikes or spicate panicles. Flowers bisexual. Calyx lobes keeled within. Disc lobed. Ovary superior, sunk in disc. Drupe globose; pyrenes 3, each 1-seeded.

Sageretia parviflora (Klein) G. Don, Gen. Syst. 2: 29. 1832; Gamble, Fl. Madras 223(160). 1918. *Rhamnus parviflora* Klein in Roemer & Schultes, Syst. 5: 295. 1820.

Unarmed climbers. Leaf-blade broadly elliptic, acute, subcordate, glabrous. Calyx lobes acute, whitish; petals white.

Central & Peninsular India. Common in thickets and deciduous forests in western plains. October-May. *CJS* 15450, 16320.

SCUTIA (Commerson ex A. P. de Candolle) Brongniart *nom. cons.*

Glabrous shrubs. Leaves entire, subopposite, pinnately veined. Inflorescence axillary, of umbels or in fascicles. Flowers bisexual. Calyx tube turbinate; lobes acute with a thickened tip. Ovary superior, sunk

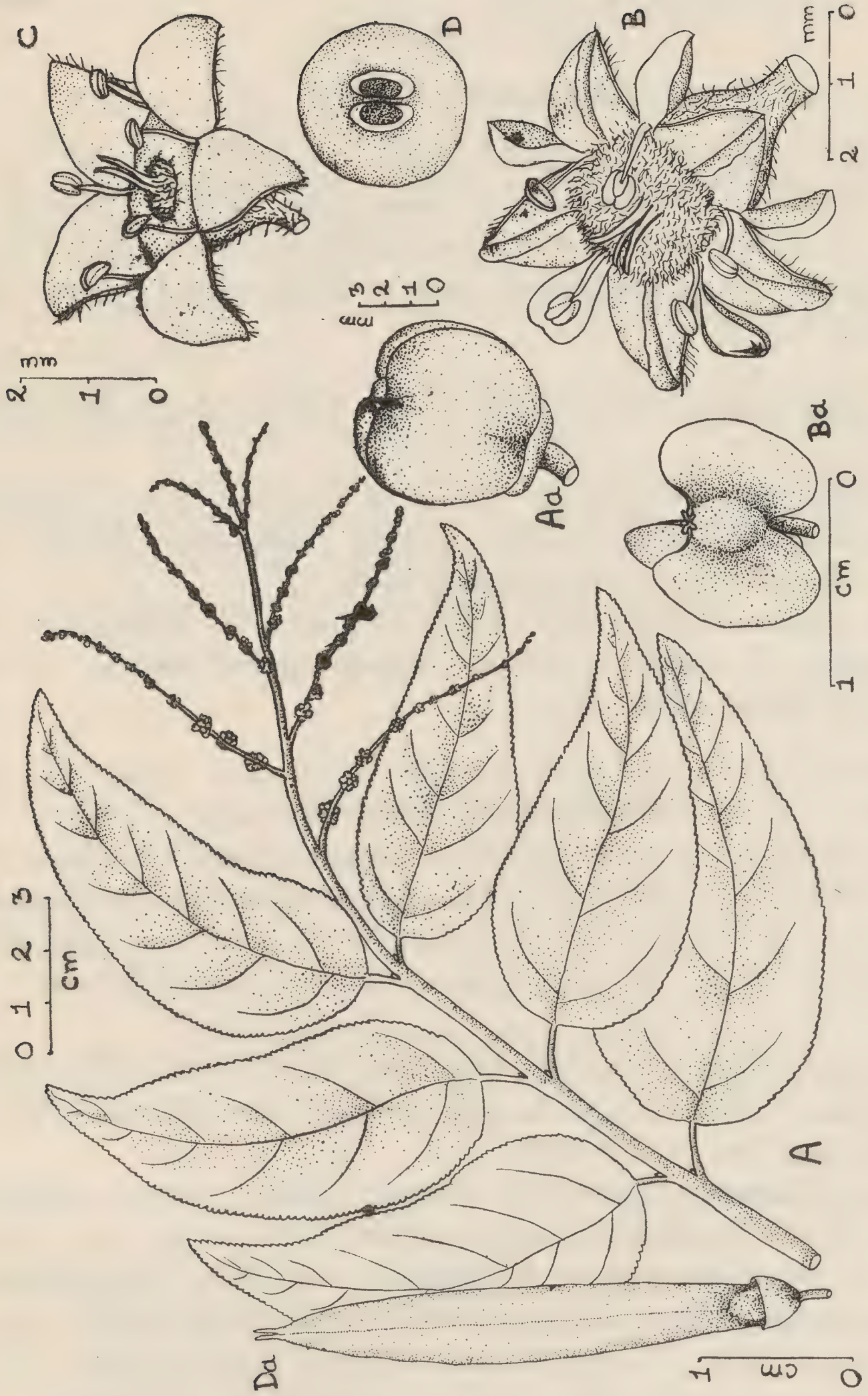


Fig. 68. RHAMNACEAE. *A. Sageretia parviflora*: flowering twig; *Aa*, fruit. *B. Gouania microcarpa*: flower; *Ba*, fruit. *C. Ziziphus rugosa*: flower. *D. Ventilago madraspatana*: section of ovary; *Da*, fruit.

in disc, usually 4-locular. Drupe with 2-4 pyrenes, supported by the persistent calyx.

Scutia myrtina (N. Burman) Kurz, J. Asiat. Soc. Bengal 44: 168. 1875; Gamble, Fl. Madras 223(160). 1918. *Rhamnus myrtinus* N. Burman, Fl. Ind. 60. 1768. *Rhamnus circumscissus* L. f., Suppl. 152. 1781. *Scutia circumscissa* (L. f.) Druce, Bot. Soc. Exch. Club Brit. Isles 646. 1917; Sant., Fl. Khandala ed. 3, 44. 1967.

Armed stragglers. Blade to 4×3.5 cm, broadly ovate. Flowers greenish-white.

Burma, Central & Peninsular India, Sri Lanka. Common stragglers in thickets in deciduous forests, along roadsides in plains and Ghats. November-August. *CJS* 9700, *HFP* 1482.

Note: "Suessenguth in Pfam. ed. 2, 20d: 58, 1953, questions the identity of *Rhamnus myrtinus* with the present species." Quotation from Santapau (*l. c.*).

VENTILAGO Gaertner

Unarmed, climbing shrubs. Leaves crenate-serrate, pinnately veined, oblique at base. Calyx lobes keeled within; petals emarginate. Anther connectives produced. Disc flat, sunk in calyx tube, angled. Ovary half-inferior, 2-locular; styles 2, flat. Fruit 1-locular, nutlike, with linear-oblong wing.

Ventilago madraspatana Gaertner, Fruct. 1: 223, t. 49, f. 2. 1788; Wight, Ic. t. 163. 1839; Gamble, Fl. Madras 218(156). 1918 ('*maderaspatana*').

Scandent shrubs. Leaf-blade to 5.2×2 cm, oblong-elliptic, shortly acute.

Western Peninsular India, Sri Lanka, Java. Common in plains and Ghats, in deciduous or semi-evergreen forests. December-April. *CJS* 13285, *HFP* 1274.

ZIZIPHUS Miller

Armed trees or shrubs, often scandent or climbing. Leaves crenate, palmately veined. Inflorescence of few-flowered cymes. Calyx tube obconic; lobes keeled within; petals sometimes 0. Disc flat. Ovary superior, 2-3(-4)-locular; styles usually free. Drupe globose, oblong with 1 pyrene, 1-3-seeded.

1 Petals 0 ..... *Z. rugosa*
1 Petals present.
2 Styles 2; fruit globose, less than 1 cm across; leaves ovate, acute, hairy beneath ..... *Z. oenoplia*
2 Styles 3; fruit globose, more than 1 cm; leaves orbicular, rounded, glabrous..... ..... *Z. xylopyrus*

Ziziphus oenoplia (L.) Miller, Gard. Dict. ed. 8, 3. 1768; Gamble, Fl. Madras 220(158). 1918. *Rhamnus oenoplia* L., Sp. Pl. 194. 1753.

Ferruginous climber. Leaf blade to 6×3 cm, ovate, subcordate, slightly oblique at base, 5-ribbed, hairy beneath. Petals white. Ovary 2-locular. Drupe less than 1 cm across.

Pantropics. Common in scrub and deciduous forests in plains. July-January. *CJS* 15652, *HFP* 497.

Ziziphus rugosa Lam., Encycl. 3: 319. 1789; Wight, Ic. t. 339. 1840; Gamble, Fl. Madras 221(158). 1918.

Pubescent climber. Leaf blade to 8×5 cm, broadly elliptic, subcordate below, pubescent beneath. Calyx lobes ovate. Petals 0. Ovary globose, villous, 2-locular. Drupe fleshy, oblong, white, to 1.5×1 cm.

Throughout India, Sri Lanka. Common in Ghats and western plains in semi-evergreen or wet deciduous forests, usually in forest clearings. January-April. Fruit edible. *CJS* 16087, 16334.

Ziziphus xylopyrus (Retz.) Willd., Sp. Pl. 1: 1104. 1798; Gamble, Fl. Madras 220(158). 1918. *Rhamnus xylopyrus* Retz., Obs. Bot. 2: 11. 1781.

Usually armed shrubs or trees to 6 m. Blade rounded, 5-8×3-4 cm, slightly oblique. Calyx lobes obconic, acute; petals white. Ovary glabrous, 3-locular. Drupe to 1.5×1.5 cm, hard.

Throughout India. Common in plains and upper Ghats, in deciduous forests. May-October. *HFP* 11, 356, 496.

88. LEEACEAE

C. J. Saldanha

LEEA Linnaeus *nom. cons.*

Herbaceous shrubs. Leaves alternate; stipules large, deciduous, amplexicaul, adnate to the petiole; blade 1-3-pinnate; leaflets serrate, pinnately veined. Inflorescence of leaf-opposed, terminal, corymbose cymes. Flowers bisexual, regular. Calyx 5-lobed; petals 5, shortly fused below, valvate, corniculate. Stamens 5; staminal tube urceolate to subglobose, entire to 5-partite, filaments inserted between lobes; anthers free and exserted or united and included. Ovary superior, 3-6-locular; ovule 1 per locule, axile; style subulate; stigma capitate. Fruit a depressed-globose, succulent, 3-6-seeded berry.

1 Flowers bright red ..... *L. guineensis*
1 Flowers greenish-white.
2 Leaves 1-pinnate ..... *L. crispa*
2 Leaves 2-3-pinnate ..... *L. indica*

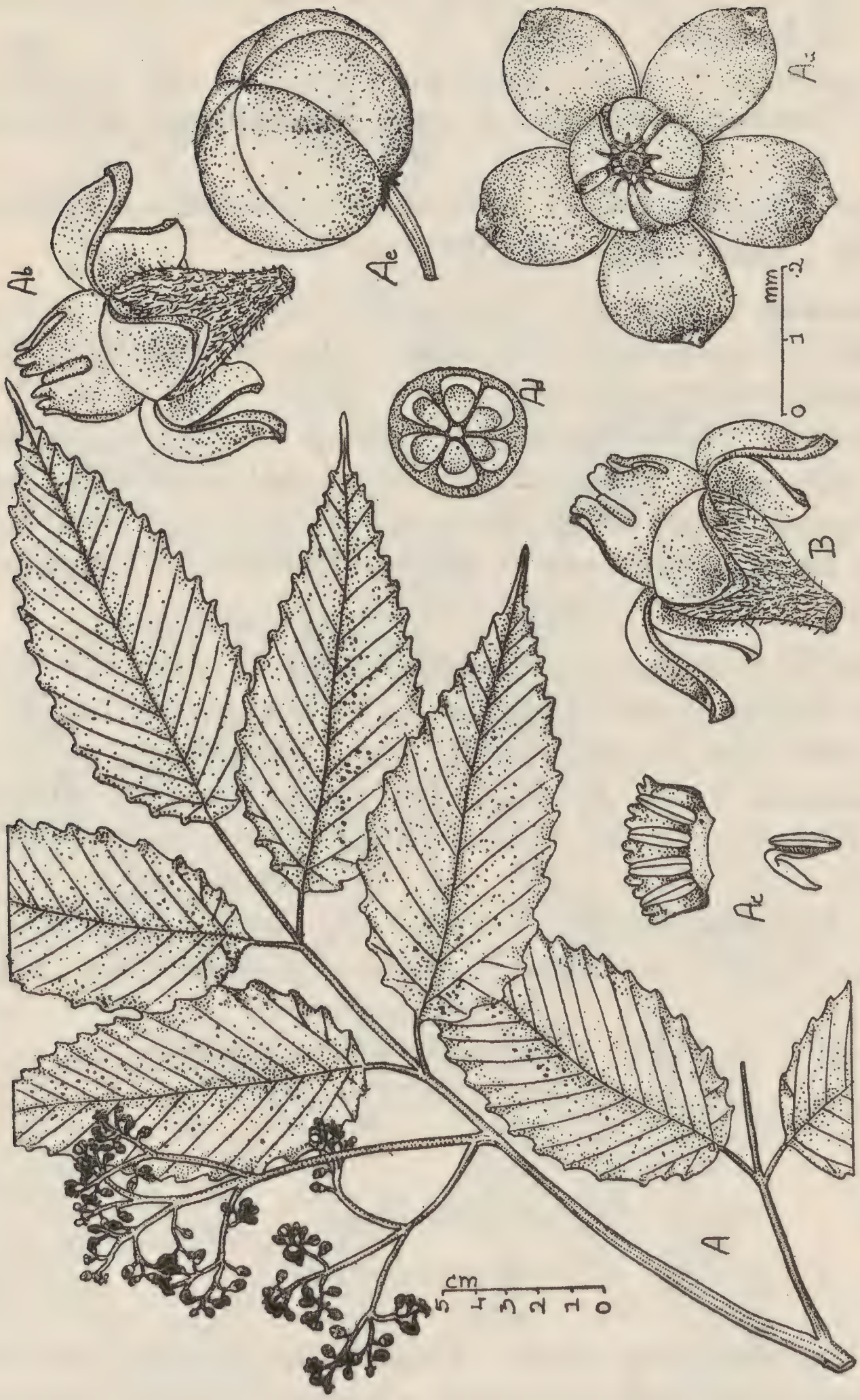


Fig. 69. LEEACEAE. *A. Leea crispa:* flowering twig; *Aa*, *Ab*, flower; *Ac*, staminal tube and stamen; *Ad*, section of ovary; *Ae*, fruit. *B. Leea guineensis*: flower.

Leea crispa van Royen ex L., Syst. Nat. ed. 12, 627. 1767 & Mant. 124. 1767; Gamble, Fl. Madras 240(171). 1915; Ridsdale, Blumea 22: 88. 1974. *Leea herbacea* Hamilton, Trans. Linn. Soc. 14: 228. 1823; Gamble, Fl. Madras 240(171). 1915. *Leea aspera* Edgeworth, Trans. Linn. Soc. 20: 36, 1846, non Wall. ex G. Don, 1831. *Leea edgeworthii* Sant., Fl. Khandala 54. 1953.

Leaves 1-pinnate, 5-7-foliate; leaflets 10-14×5.5-8 cm, oblong, acute-acuminate, truncate-cordate. Flowers greenish-white. Berry 0.8 cm across.

Indomalaya. Fairly common in Ghats in wet deciduous to semi-evergreen forests. July-August. *CJS* 10912, *HFP* 351.

Leea guineensis G. Don, Gen. Syst. 1: 712. 1831; Ridsdale, Blumea 22: 92. 1974. *Leea wightii* C. B. Clarke, J. Bot. 19: 105. 1881; Gamble, Fl. Madras 239(171). 1915.

Undershrubs. Leaves 1-2-pinnate; leaflets 12-19×5-6 cm, oblong-lanceolate, acuminate, subtruncate. Flowers and buds bright red.

West Tropical Africa through India to Micronesia. Fairly common in shade of forest undergrowth at Kenchankumri State Forest in lower Shiradi Ghat. June-July. *HFP* 243, 1903.

Leea indica (N. Burman) Merrill, Philipp. J. Sci. 14: 245. 1919; Ridsdale, Blumea 22: 95. 1974. *Staphylea indica* N. Burman, Fl. Ind. 75, t. 23, f. 2. 1768. *Aquilicia sambucina* L., Mant. Alt. 211. 1771, *nom. illegit.* *Leea sambucina* Willd., Sp. Pl. 1: 1177. 1798, *nom. illegit.*; Wight, Ic. t. 78. 1838; Gamble, Fl. Madras 240(172). 1915; Backer & Bakh. f., Fl. Java 2: 94. 1965.

Leaves 2-3-pinnate; leaflets 6-17×3-6 cm, ovate, oblong-lanceolate, acute-acuminate, truncate-cordate. Flowers greenish-white. Berry 0.6 cm across.

China, India to Australia. Common in semi-evergreen forests in Ghats. December-July. *CJS* 16342, *HFP* 1571.

89. VITACEAE

T. P. Ramamoorthy

Usually tendril-bearing shrubs. Leaves alternate, stipulate, simple or compound, usually crenate-serrate, palmately veined. Inflorescence leaf-opposed, sometimes axillary, cymose. Flowers bisexual or unisexual, regular, pedicelled. Calyx 4-6-toothed, often truncate, persistent; petals 4-5, valvate, usually free (or connivent by tips and calyptrate), corniculate and hooded at tip; stamens free, as many as and opposite petals, inserted at base of disc; anthers dorsifixed; disc intrastaminal, usually fleshy, entire,

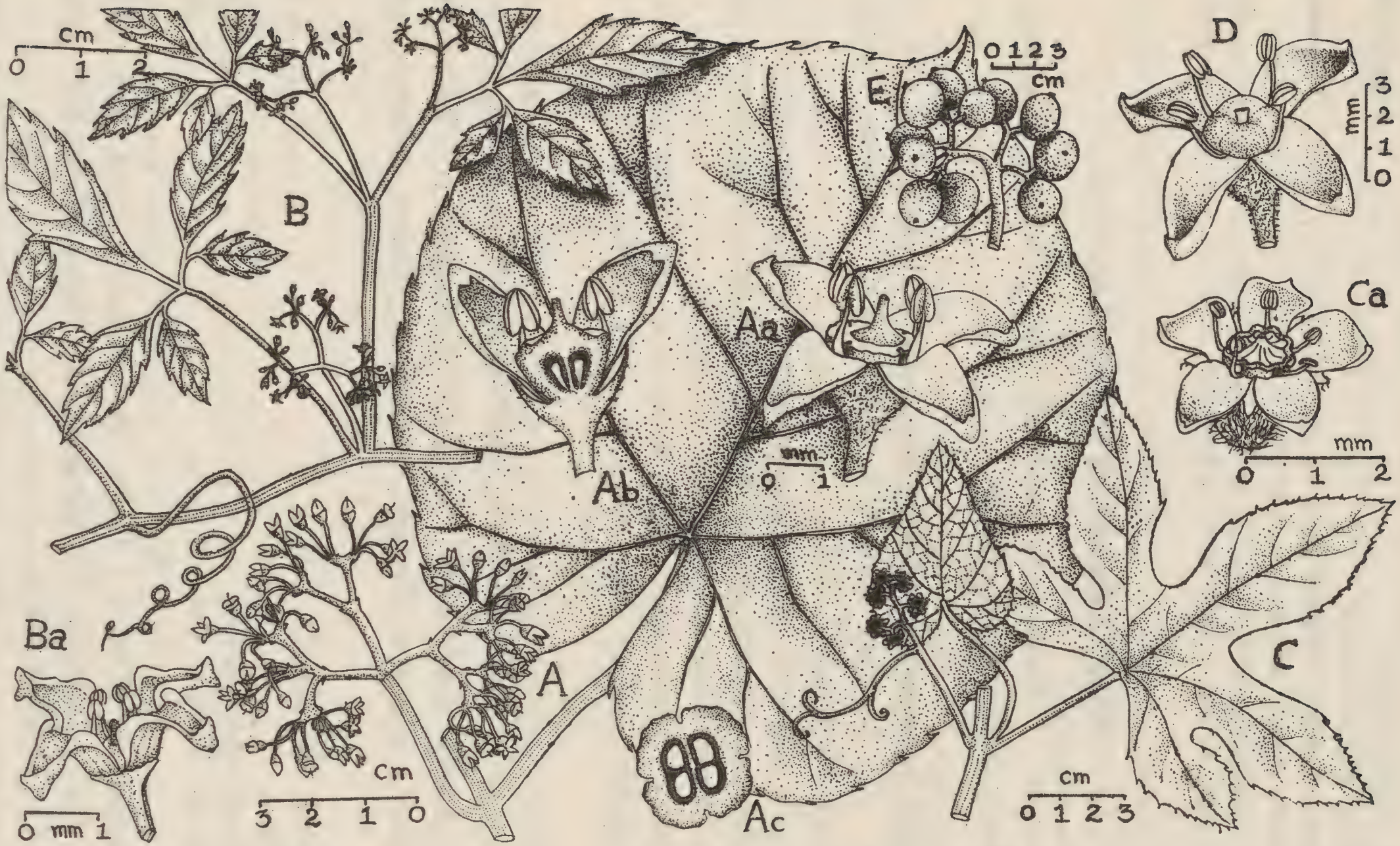


Fig. 70. VITACEAE. *A. Cissus pallida*: flowering node; *Aa*, flower; *Ab*, vertical section of same; *Ac*, section of ovary. *B. Cayratia japonica*: twig; *Ba*, flower. *C. Ampelocissus tomentosa*: flowering node; *Cà*, flower. *D. Tetrastigma muricatum*: male flower. *E. Tetrastigma sulcatum*: fruits.

lobed or sometimes furrowed. Ovary superior, usually immersed in disc, 2-locular; ovules 2 per locule, basal; style short, sometimes none; stigma usually obscure. Fruit indehiscent, fleshy berry, with smooth or tubercled seeds.

1 Inflorescence tendril-bearing.....**Ampelocissus**
1 Inflorescence not tendril-bearing.
2 Flower unisexual; stigma 4-lobed.....**Tetrastigma**
2 Flower bisexual; stigma indistinct.
3 Leaves not lobed; berry 1-seeded.....**Cissus**
3 Leaves pedately 3-many-lobed; berry 2-4-seeded.....**Cayratia**

AMPELOCISSUS Planchon *nom. cons.*

Leaves simple. Inflorescence tendriliferous. Flowers bisexual, 5-merous. Ovary 10-furrowed at apex.

Ampelocissus tomentosa (Roth) Planchon, J. Vigne Am. 374. 1883; Gamble, Fl. Madras 230(165). 1915. *Vitis tomentosa* Heyne ex Roth, Nov. Pl. Sp. 157. 1821.

Plants usually covered with cinnamoneous wool. Leaves to 7-15× 5-18 cm, orbicular, cordate, often 3-5-lobed, serrate, drying brown below. Flowers red. Berry black.

South W. India. Common, in open scrub and deciduous forests in the plains and upper Ghats. May-August. *CJS* 13960, *HFP* 481.

CAYRATIA A. Jussieu *nom. cons.*

Leaves pedately compound; tendrils leaf-opposed. Inflorescence usually axillary. Flowers bisexual, 4-merous. Calyx truncate; petals reflexed.

1 Leaves pedately 7-9-foliate.....*C. pedata*
1 Leaves 3-5-foliate.
2 Leaves 3-foliate, softly villous.....*C. mollissima*
2 Leaves pedately 5-foliate, glabrous.....*C. japonica*

Cayratia japonica (Thunb.) Gagn. in Lecomte, Notul. Syst. (Paris) 1: 349. 1911; Gamble, Fl. Madras 237(169). 1915. *Vitis japonica* Thunb. Fl. Jap. 104. 1784.

Slender herbaceous climber or trailer. Leaves 5-foliate; leaflets elliptic, serrate, glabrous, membranous. Flowers white.

Indomalaysia. Common in Ghats, in shade or otherwise, usually along edges of wet deciduous to semi-evergreen forests, sometimes trailing along road-sides. June-July. *CJS* 14053, *HFP* 305.

Cayratia mollissima (Wall.) Gagn. in Lecomte, Notul. Syst. (Paris) 1: 345. 1911; Gamble, Fl. Madras 237(169). 1915. *Vitis mollissima* Wall. in Roxb., Fl. Ind. 2: 482. 1824.

Slender climber, softly villous all over. Leaves 3-foliate; leaflets 10-15×6-9 cm, broadly ovate, serrate; the laterals with shorter petiolules and asymmetrical. Peduncle articulated below. Flowers white. Berry to 1.8×1.8 cm, rounded, hairy; seed plano-convex.

S. India, Burma, Malaysia. Common, in shade along outskirts of wet deciduous to semi-evergreen forests in Ghats. March-July. *CJS* 16765, *HFP* 2724.

Cayratia pedata (Lour.) Juss. ex Gagn. in Lecomte, Notul. Syst. (Paris) 1: 346. 1911; Taxon 8: 309. 1959; Gamble, Fl. Madras 236(139).1915. *Cissus pedata* Lam., Encycl. 1: 31. 1783. *Columella pedata* Lour., Fl. Cochinch. 1: 85. 1790.

Large climbers. Leaves 7-9-foliolate; leaflets 5-15×2-6 cm, lanceolate, acute to acuminate, cordate asymmetrical, sometimes truncate, crenate. Flowers white. Berry globose, green, to 0.7×0.4 cm, glabrous, 2-seeded.

Indomalaysia. Fairly common, on trees overhanging streams in upper Ghats. August-January. *CJS* 14469, 16214.

Note: Dr. Furtado (*Taxon* 13: 244. 1964) regards *Cayratia pedata* (Lam.) Gagn. as the correct name for the species. We have, however, followed the Code (*nom. cons.* 4918a) and the ING Card.

CISSUS Linnaeus

Climbing or sometimes erect herbaceous perennials. Leaves simple; tendrils leaf-opposed. Cymes umbellate. Flowers bisexual, 4-merous. Calyx truncate. Berry globose, usually 1-seeded.

1 Stem 4-angled ..... *C. quadrangularis*
1 Stem terete, not angled.
2 Shrubs, erect ..... *C. pallida*
2 Shrubs, climbing.
3 Leaves dark red beneath ..... *C. discolor*
3 Leaves green beneath ..... *C. adnata*

Cissus adnata Roxb., Fl. Ind. 1: 423. 1820; Gamble, Fl. Madras 237(170). 1915.

Hairy climbing shrubs. Blade to 10×7.5 cm, ovate, acuminate, cordate, serrate, with many parallel veins connecting basal veins, glabrescent. Flowers red. Seeds smooth.

Indomalaysia. Fairly common in semi-evergreen forests in lower Shiradi Ghat. October-December. *CJS* 12081, 15415.

Note: *CJS* 13311, *CJS* 16512 and *HFP* 1462 all from Bisle Ghat, flowering in the hot season, are similar to *C. adnata* except for the glabrous peduncles and shoots.

Cissus discolor Blume, Bijd. 181. 1825; Gamble, Fl. Madras 235(168). 1915.

Slender climbers. Leaves with red petiole, 10-12×5-7 cm, oblong-lanceolate, cordate-truncate, serrate, dark red beneath. Pedicel bright red. Berry to 0.75 cm across.

Indomalaysia. Common in Ghats in wet deciduous to semi-evergreen forests. August-October. *CJS* 11282, 15400, *HFP* 423.

Cissus pallida (Wight & Arn.) Planchon in A. & C. DC., Monogr. Phan. 5: 477. 1887; Gamble, Fl. Madras 234(167). 1915. *Vitis pallida* Wight & Arn., Prodr. 125. 1834.

Erect or rarely scandent shrubs with glaucous white stem, occasionally tendril-bearing. Blade 10-16×12-20 cm, orbicular-cordate, toothed. Flowers white. Berry to 0.6 cm across.

E. Africa, W. Himalayas, Central & S. India. Locally common in open scrub or deciduous forests to the east of Arsikere town. May-August. *CJS* 13846, *HFP* 1955.

Cissus quadrangularis L., Mant. 39. 1767; Gamble, Fl. Madras 233(167). 1915.

Herbaceous trailer with stout rootstock; stem sharply 4-angled. Blade 2-2.2 cm across, orbicular, crenate. Flowers white. Berry 0.7 cm across.

Indomalaysia, including Himalayas. Locally common around outskirts of Arsikere town, on tank bunds and roadsides. September. The stem is used as a vegetable. *CJS* 17913.

TETRASTIGMA Planchon

Leaves compound; tendrils leaf-opposed. Cymes umbellate. Flowers unisexual, 4-merous. Seeds usually transversely wrinkled.

1 Stem terete..... *T. muricatum*
1 Stem sulcate..... *T. sulcatum*

Tetrastigma muricatum (Wight & Arn.) Gamble, Fl. Madras 229 (164). 1915. *Vitis muricata* Wall. ex Wight & Arn., Prodr. 128. 1834; Wight, Ic. t. 740. 1844.

Branches terete, muricate. Leaves usually 3-foliolate; leaflets 10-15× 5-8 cm, broadly elliptic, rounded at base, distantly serrate. Inflorescence branches ferruginous, rarely glabrate. Flower greenish-white. Calyx and petals hairy. Berry to 1 cm across.

South W. India. Common in semi-evergreen forests in lower Ghats. December-February. *CJS* 12837, 15871, 16904.

Tetrastigma sulcatum (Lawson) Gamble, Fl. Madras 229(164). 1915.

Vitis sulcata Lawson in J. Hooker, Fl. Brit. India 1: 661. 1875.

Branches angled, sulcate, nearly smooth. Leaves 3-4-foliolate; leaflets 6-9×2-4 cm, elliptic; lateral leaflets asymmetrical. Inflorescence branches hairy. Fruit 2-2.5 cm across.

South W. India. Occasional in wet deciduous to semi-evergreen forests in Ghats. February-March. *CJS* 16526.

90. STAPHYLEACEAE

K. N. Gandhi

TURPINIA Ventenat *nom. cons.*

Shrubs or trees. Leaves opposite, odd-pinnate; stipules interpetiolar, early caducous and leaving annular scars; leaflets opposite, serrulate. Inflorescence a panicle. Flowers bisexual, regular, bracteate. Sepals 5, almost free, imbricate, persistent. Petals 5, free, orbicular, imbricate. Stamens 5, inserted outside or on the disc, free; filaments flattened, anthers versatile. Disc lobed or crenulate. Ovary superior, 3-locular; locule with 1-many, axile, biseriate ovules; styles 3, free or appressed; stigmas united, 3-lobed. Fruit fleshy or coriaceous berry, few-many-seeded, crowned with scars of styles.

Turpinia malabarica Gamble, Bull. Misc. Inform. 135. 1916; Fl. Madras 241(173). 1918.

Large trees. Leaf axis 12 cm long; leaflets in 2-3 pairs, elliptic-lanceolate, acuminate, subcuneate, 9-14×5 cm, glabrous, subcoriaceous. Flowers white. Staminal filaments pubescent. Fruit globose, 1.5 cm across, greyish, 4 seeded.

South W. India. Collected once in fruit in lower Shiradi Ghat on June 21, 1972. *HFP* 2837.

91. CONNARACEAE

T. P. Ramamoorthy

Woody. Leaves alternate, estipulate, odd-pinnately compound; leaflets entire, pinnately veined. Flowers paniculate, bisexual, regular. Calyx deeply 5-parted, persistent. Petals 5, free. Disc usually present. Stamens 5 or 10, in latter case those opposite petals smaller than others, often monadelphous at base. Pistils 1 or 4-5, superior; each 1-locular; ovules 2 per locule, erect; styles elongate, each unbranched; stigma usually capitellate. Follicles with 1-2 arillate seeds.

Fig. 71. CONNARACEAE. *A. Connarus wightii*: flowering branch; *Aa*, flower with calyx and corolla removed; *Ab*, fruit; *Ac*, arillate seed. *B. Rourea minor*: flower, side view; *Ba*, same, without sepals and petals.

1 Panicle rusty-pubescent; calyx persistent, clasping pedicel of fruit; pistil 1....**Connarus**
1 Panicle glabrous; calyx accrescent, clasping base of sessile fruit; pistils 5.....**Rourea**

CONNARUS Linnaeus

Calyx not accrescent. Stamens 10. Pistil 1. Follicle stalked, inflated, striate, shining.

Connarus wightii J. Hooker, Fl. Brit. India 2: 51. 1876; Gamble, Fl. Madras 273(194). 1918; Schellenberg in Engl., Pflanzenr. 127: 227. 1938. *Connarus ritchiei* J. Hooker, Fl. Brit. India 2: 51. 1876.

Shrubby climber. Leaflets 5, 6-11×2.5-5 cm, oblong-lanceolate, abruptly acuminate with a blunt tip, rounded at base. Inflorescence rusty pubescent. Corolla white. Follicles to 2.5×1.5 cm, bright red, turning brown. Seeds shining black with a fleshy yellow aril.

South W. India. Common in Ghats, on trees, thickets and rarely on road cuts. Flowers during March-April, remaining in fruit over a considerable length of time. *CJS* 15911, *HFP* 2722.

ROUREA Aublet *nom. cons.*

Leaflets to 9. Calyx accrescent. Pistils 5, 4 often imperfect, sessile.

Rourea minor (Gaertner) Alston in Trimen, Handb. Fl. Ceylon 6: 67. 1931 ('*minus*)'; Leenh. in Steenis, Fl. Malesiana ser. 1, 5: 514. 1958. *Aegiceras minus* Gaertner, Fruct. 1: 216, t. 46. 1788. *Connarus santaloides* Vahl, Symb. 4: 87. 1794. *Rourea santaloides* (Vahl) Wight & Arn., Prodr. 144. 1844; Gamble, Fl. Madras 272(193). 1918.

Climbing shrub. Leaflets 5-7.5×1.5-3 cm, elliptic-lanceolate. Inflorescence glabrous. Flowers white. Follicle to 2.5×1.5 cm, elliptic. Seed 1, with yellow aril.

Indomalaysia. Common in wet deciduous or semi-evergreen forests in Ghats. September-May. *CJS* 13712, *HFP* 972, 1053.

92. SAPINDACEAE

K. N. Gandhi

Usually woody. Leaves alternate; stipules usually 0; blade usually compound; venation pinnate. Inflorescence a simple or branching raceme. Flowers usually polygamodioecious and irregular, small, 4-5-merous. Sepals usually connate at base, imbricate or valvate, equal or unequal. Petals free, equal or unequal, often with scales, sometimes absent. Disc usually present. Stamens usually twice the number of

Fig. 72. SAPINDACEAE. *A. Sapindus laurifolia*: flowering twig; *Aa*, flower; *Ab*, fruit. *B. Dimocarpus longan*: female flower; *Ba*, fruit; *Bb*, stamens of male flower. *C. Lepisanthes tetraphylla*: section of flower. *D. Cardiospermum halicacabum*: fruit. *E. Otonephelium stipulaceum*: fruit.

sepals, usually inserted inside the disc; filaments usually pubescent. Pistillode present or absent in staminate flower. Staminodes in pistillate flower similar to stamens but shorter and with empty anthers. Ovary superior, usually villous, lobed, and 2-6-locular; ovules 1 (-2) per locule; style terminal, as many-fid as locules; stigmas simple. Fruit usually a capsule or schizocarp; seeds usually arillate.

1 Climbing herbaceous plants. Leaves biternate.....**Cardiospermum**
1 Shrubs or trees. Leaves not biternate.
2 Leaves simple.....**Dodonaea**
2 Leaves compound.
3 Leaves digitately 3-foliolate.....**Allophylus**
3 Leaves pinnate.
4 Lowest pair of leaflets smaller than others and stipuliform.....**Otonephelium**
4 All the leaflets similar.
5 Stamens and staminodes glabrous. Fruit a capsule.....**Harpullia**
5 Stamens and staminodes pubescent. Fruit not a capsule.
6 Petals 0. Ovary entire. Fruits tipped with persistent, rigid style..**Schleichera**
6 Petals present. Ovary lobed or angled. Style deciduous.
7 Petals each with 2 scales. Ovary eccentric, bluntly trigonous as fruit.....
.....**Lepisanthes**
7 Petals without any scales. Ovary centric, 2-3-lobed.
8 Fruits tubercled. Staminal filaments medium.....**Dimocarpus**
8 Fruits smooth; staminal filaments very short.....**Sapindus**

ALLOPHYLUS Linnaeus

Leaves usually digitately 3-foliolate; leaflets subserrate. Racemes axillary, with several, interrupted fascicles of flowers. Flowers 4-merous. Sepals in opposite pairs, slightly hooded, outer pair smaller. Petals unilateral, sometimes obsolete, declinate, with shaggy scale above the claw. Disc unilateral, of 4 unequal glands, opposite petals. Stamens inserted inside the disc. Ovary 2-lobed and 2-locular; styles free or connate at base. Schizocarp of 1 (-2) globose or ovoid coccus. Seed with short, fleshy aril.

Allophylus cobbe (L.) Raeusch., Nomencl. Bot. ed. 3, 108. 1797; Hiern in J. Hooker, Fl. Brit. India 1: 673. 1875; Leenhouts, Blumea 15: 322. 1968. *Rhus cobbe* L., Sp. Pl. 267. 1753. *Schmidelia rheedii* Wight, Ic. t. 964. 1845, *nom. illegit.* *Allophylus rheedii* (Wight) Radlk. in Engl. & Prantl, Pflanzenfam. 3(5): 313. 1895; Gamble, Fl. Madras 246(176). 1918; Leenhouts, Blumea 15: 348. 1968.

Ferruginous shrubs or small trees. Lateral leaflets ovate, middle one obovate, 10-16×4-7 cm. Peduncle with few branches near base, longer than leaves, slender. Flowers white. Styles connate below. Fruits 0.5 cm across.

South India, Sri Lanka, S. E. Asia. Scattered across the Ghats. May-August. *HFP* 309, 1909.

Note: *Schmidelia* L. (1767) is a later homonym of *Schmidelia* Bochm. (1760). Leenhouts (1968) suggests that *A. rheedii* should be combined with *A. cobbe* (L.) Raeusch.

CARDIOSPERMUM Linnaeus

Slender, climbing herbs. Leaves biternate; leaflets coarsely toothed. Inflorescence axillary, 2-tendriliferous at base, 3-branched; branches racemiform with few flowers near apex. Flowers 4-merous. Sepals in opposite pairs; outer pair smaller. Petals unequal, with scales on the inner side of their bases. Disc unilateral, of 2 glands opposite the lower petals. Stamens eccentric; filaments free or connate below, unequal. Ovary villous, 3-locular; ovules axillary; style short. Capsule trigonous, inflated, loculicidally 3-valved, membranous. Seed often arillate at base.

Cardiospermum halicacabum L., Sp. Pl. 366. 1753; Wight, Ic. t. 508. 1841; Gamble, Fl. Madras 244(175). 1918.

Stem and branches furrowed. Petiole 5-8 cm long; leaflets ovate, acuminate, to 5×3 cm, glabrescent. Flowers small, yellow. Capsule winged.

Tropics. Fairly common in Byrapura. July-December. *CJS* 14336, 15794.

DIMOCARPUS Loureiro

Leaves even-pinnate. Leaflets entire. Flowers polygamous, regular. Petals villous. Disc annular. Stamens 5-10. Ovary villous, 2-3-lobed and locular. Fruit a schizocarp with 1-3, smooth or weakly tubercled, 1-seeded cocci. Seed globose, enclosed by pulpy aril.

Dimocarpus longan Lour., Fl. Cochinch. 233. 1790; Leenhouts, Blumea 19: 122. 1971. *Euphoria longan* (Lour.) Steudel, Nomencl. Bot. 1: 328. 1921; Backer & Bakh. f., Fl. Java 2: 136. 1965. *Euphoria longana* Lam., Encycl. 3: 574. 1792; Bedd., Fl. Sylv. t. 156. 1871. *Nephelium longana* (Lam.) Camb., Mem. Mus. Hist. Nat. 18: 30. 1829; Gamble, Fl. Madras 252(180). 1918.

Trees. Leaf axis 20 cm long; leaflets usually in 2-3 pairs, ovate-lanceolate, subobtuse at apex, rounded at base, to 20×7 cm, shining. Peduncle and calyx yellow-pubescent. Petals white. Fruit globose, tubercled, red, 1.5 cm across.

Tropics. Common in Ghats. February-September. *HFP* 1451, 2154.

DODONAEA P. Miller

Leaves usually simple. Flowers polygamodioecious or unisexual, regular. Sepals 2-5. Petals 0. Disc 0 in male, small in female flowers. Stamens usually 8, subsessile, glabrous. Ovary 3-6-locular; ovules 2 per locule, ascending or pendulous. Capsule membranous or coriaceous, retuse at both apices, valves acute or winged.

Dodonaea viscosa N. Jacq., Enum. Syst. Pl. Carib. 10. 1760; L., Mant. Alt. 228. 1771; Gamble, Fl. Madras 253(181). 1918. *Ptelea viscosa* (N. Jacq.) L., Sp. Pl. ed. 2, 173. 1762, non L., 1753.

Leaves simple, elliptic-oblong or obovate, to 8×1.8 cm, shining, subcoriaceous. Inflorescence shorter than leaves. Capsule to 1.5 cm long, 2-3-winged.

Tropics. Fairly common in scrub of plain. All seasons. *CJS* 9161, 11642.

HARPULLIA Roxburgh

Trees. Leaves even-pinnate. Flowers dioecious or polygamous, regular. Petals linear-obovate. Disc obscure. Stamens 5-8, glabrous. Ovary tomentose, 2-locular; ovules 2 per locule, axillary; style short or elongate and twisted. Fruit an inflated, coriaceous, 2-lobed, loculicidally 2-valved capsule. Seeds arillate.

Harpullia arborea (Blanco) Radlk., Sitzungsber. Math.-Phys. Cl. Koenigl. Bayer. Akad. Wiss. Muenchen 16: 404. 1890. *Ptelea arborea* Blanco, Fl. Filip. ed. 1, 63. 1837. *Harpullia imbricata* Thwaites, Enum. 56. 1858; Gamble, Fl. Madras 253(180). 1918.

Leaf axis 20 cm long; leaflets oblong-lanceolate, to 15×5 cm. Inflorescence shorter than leaves. Capsule orange-scarlet, to 4×5 cm, 4-seeded.

Indomalaysia. Occasional in upper Shiradi Ghat. October-February. *CJS* 12835, *HFP* 1474.

LEPISANTHES Blume

Leaves even-pinnate; leaflets in few pairs, entire; basal pair sometimes stipuliform. Flowers regular. Outer 2 sepals smaller. Petals obovate, each with 1-2 reflexed, hooded scales on the inner side above claw, hairy along the margin toward base. Disc annular. Stamens 8. Ovary eccentric, 3-locular; ovules axillary; style short; stigma blunt or 3-lobed. Fruit drupaceous, 3-lobed, tomentose.

Lepisanthes tetraphylla (Vahl) Radlk., Sitzungsber. Math.-Phys.

Cl. Koenigl. Bayer. Akad. Wiss. Muenchen 8: 276. 1878; Gamble, Fl. Madras 247(176). 1918; Leenhouts, Blumea 17: 63. 1969. *Sapindus tetraphylla* Vahl, Symb. 3: 54. 1794. *Sapindus deficiens* Wight & Arn., Prodr. 111. 1834. *Hemigyrosa deficiens* (Wight & Arn.) Bedd., Fl. Sylv. t. 231. 1872. *Lepisanthes deficiens* (Wight & Arn.) Radlk., *l. c.*; Gamble, *l. c.*

Leaf axis 20 cm long; leaflets 2-3-paired, elliptic-oblong, rounded at base, 16-20×4-5 cm, shining, coriaceous. Inflorescence yellow-pubescent; lateral branches short. Petals white, with 2 scales, outer reflexed, inner laciniate. Fruits yellow-velvety, depressed at apex with age, to 1.5 cm across.

South W. India, Sri Lanka, Burma. Occasional in lower Bisle Ghat. December-May. *CJS* 16029, 16510.

OTONEPHELIUM Radlkofer

Leaves even-pinnate; leaflets in 3-4 pairs, entire; lowest pair sometimes stipuliform. Flowers 4-6-merous, regular. Petals 4-6 or 0. Disc annular. Stamens 6-10. Ovary pubescent, lobed, 2-3-locular. Fruit a schizocarp, of 1-3 echinate, 1-seeded, cocci; seed covered by fleshy aril.

Otonephelium stipulaceum (Bedd.) Radlk., Sapindac. Holl.-Ind. 71. 1879. *Nephelium stipulaceum* Bedd., Trans. Linn. Soc. London 25: 212. 1865; Fl. Sylv. t. 155. 1871; Ic. t. 103. 1874; Gamble, Fl. Madras 252(180). 1918.

Leaf axis 10 cm long; leaflets in 3 or more pairs; upper pairs elliptic-oblong, subacute at apex and base, pale green, to 14×6.5 cm; lower pair unequally reniform, stipulaceous, to 2×3 cm. Panicle more or less shorter than leaves. Calyx hirsute. Petals 0. Fruits ellipsoid, densely echinate, to 2×1.5 cm.

South W. India. Collected once in fruit in lower Shiradi Ghat on June 21, 1972. *HFP* 2848.

SAPINDUS Linnaeus

Leaves even-pinnate; leaflets entire. Flowers polygamous. Sepals 2-seriate. Petals with or without scales. Disc annular. Ovary 2-4-locular. Schizocarp of 1-3 indehiscent cocci. Seeds exarillate.

Sapindus laurifolia Vahl, Symb. 3: 54. 1794; Gamble, Fl. Madras 250(178). 1918 ('*laurifolius*'). *Sapindus trifoliata* auct. non L.: Hiern in J. Hooker, Fl. Brit. India 1: 682. 1875, pro parte ('*trifoliatus*').

Small trees. Leaf axis 15 cm long; leaflets usually in 2-3 pairs, shortly

petiolulate, elliptic-lanceolate, acuminate, 12-20 × 3-8 cm, shining, almost glabrous. Flowers subregular. Sepals pubescent outside. Petals brown outside, white-villous on both the sides, without scales. Fruit of combined drupes, ferruginous, glabrescent with age.

India, Sri Lanka. Scattered across the District. All seasons. *CJS* 16028, *HFP* 1211. The fruits are used as substitute for soap.

Note: Some authors like Hiern (*l.c.*) synonymize *S. laurifolia* and *S. emarginata* Vahl under *S. trifoliata* L. Some others, e.g. Gamble (*l.c.*), Santapau (*Fl. Khandala* ed. 3, 49. 1967), keep them as two different species. There is still another view that *S. trifoliata* L. is a *nomen ambiguum.*

SCHLEICHERA Willdenow *nom. cons.*

Leaves even-pinnate; leaflets in 3 pairs, sessile, entire or wavy. Inflorescence with interrupted whorls of flowers. Flowers regular. Petals 0. Disc flat, undulate. Stamens 6-8. Ovary entire, villous, 3-4-locular. Fruit crustaceous, apiculate. Seed enclosed by pulpy aril.

Schleichera oleosa (Lour.) Oken, Allg. Naturgesch. 3(2): 1341. 1841; Merrill, Interpr. Rumph. Herb. Amboin. 337. 1917; Sant., Fl. Khandala ed. 3, 48. 1967. *Pistacia oleosa* Lour., Fl. Cochinch. 615. 1790. *Schleichera trijuga* Willd., Sp. Pl. 4: 1096. 1805; Bedd., Fl. Sylv. t. 119. 1871; Gamble, Fl. Madras 248(177). 1918; Radlk. in Engl., Pflanzenfam. 98D: 874. 1932.

Leaves bright red when young; leaf axis 10-12 cm long; leaflets oblong-lanceolate, truncate at base, to 18 × 8 cm, coriaceous, shining above. Flowers greenish-white. Fruits to 15 × 1 cm, slightly rough.

Indomalaysia. Scattered across the Ghats and in dry deciduous forests. February-May. *CJS* 12774, *HFP* 2670.

93. BURSERACEAE

T. P. Ramamoorthy

Woody plants, often with fragrant sap, usually deciduous. Leaves alternate, estipulate but lower leaflets sometimes stipuliform, odd-pinnate; leaflets entire-serrate, pinnately veined. Inflorescence axillary, usually paniculate and bracteate. Flowers usually bisexual, regular, 3-5-merous. Calyx lobed, valvate, persistent. Petals free, imbricate. Stamens twice the number of petals, usually in one whorl. Disc intrastaminal. Ovary superior, 2-5-locular; ovules 2 per locule, axile, above middle of locule, often pendulous; style simple; stigma usually lobed. Fruit drupaceous, sometimes finally dehiscent, with 1-5 pyrenes. Seeds pendulous.

1 Leaves trifoliolate; flowers 4-merous.....**Commiphora**
1 Leaves 7-many-foliolate; flowers 3 or 5-merous.
2 Flowers 3-merous.....**Canarium**
2 Flowers 5-merous.
3 Bark peeling off in thin flakes; fruit a 3-lobed drupe; hypanthium absent.....
.....**Boswellia**
3 Bark not peeling; fruit entire; hypanthium present.....**Garuga**

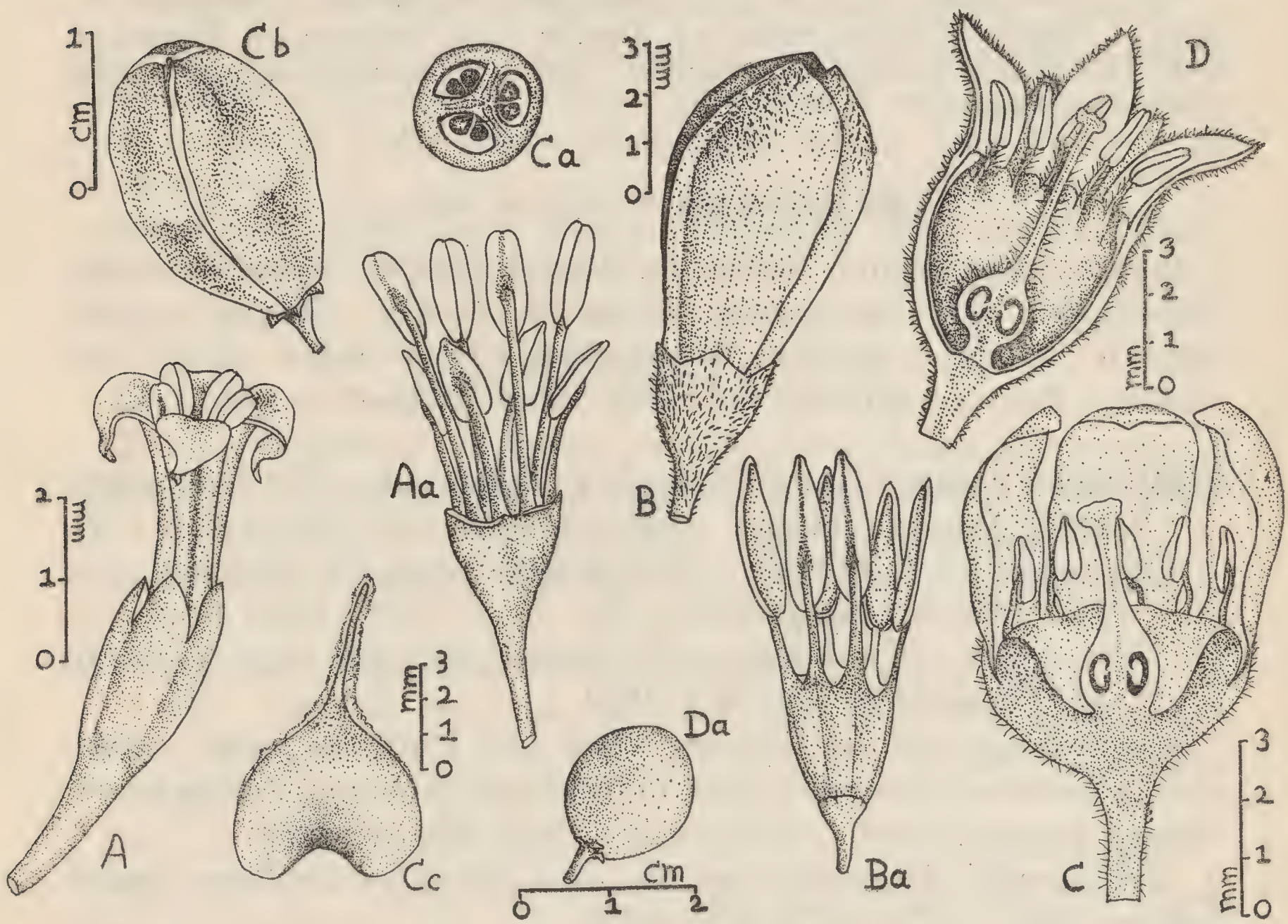


Fig. 73. BURSERACEAE. *A. Commiphora caudata*: flower; *Aa,* same, showing stamens. *B. Canarium strictum*: flower; *Ba,* same, showing stamens. *C. Boswellia serrata*: vertical section of flower; *Ca,* section of ovary; *Cb,* fruit; *Cc,* seed. *D. Garuga pinnata*: vertical section of flower; *Da,* fruit.

BOSWELLIA Roxburgh ex Colebrooke

Deciduous trees with papery bark. Flower 5-merous. Calyx toothed. Stamens dimorphic, free; disc annular. Ovary 3-locular. Drupe trigonous, 3-valved; pyrenes falling from the persistent trigonous axis; seeds flattened; margins winged.

Boswellia serrata Roxb. ex Coleb., Asiat. Res. 9: 379, t. 5. 1807; Bennett in J. Hooker, Fl. Brit. India 1: 528. 1875. *Chloroxylon dupada* Ham., Journ. Mysore 1: 184. 1807, *nom. subnud. Boswellia glabra* Roxb., Pl. Cor. t. 207. 1811; Bedd., Fl. Sylv. t. 124. 1871;

Gamble, Fl. Madras 168(120). 1915. *Boswellia serrata* var. *glabra* (Roxb.) Bennett in J. Hooker, Fl. Brit. India 1: 528. 1875.

Leaf axis white-pubescent. Leaflets 19-23, sessile, 3.5-9×1.5-2 cm, oblong-ovate, emarginate. Panicle pubescent. Petals white, shortly clawed. Capsule to 1.8×1.1 cm, green, smooth. Seeds 3.

Central & North West India. Locally common in dry deciduous forest at Nagpuri. January-March. *CJS* 16064, 16609, *HFP* 1271.

CANARIUM Linnaeus

Leaflets petiolulate, sometimes unequal. Female inflorescence reduced to racemes. Flowers bisexual or polygamous, 3-merous. Calyx lobed, nearly covering the corolla in female. Stamens partly or fully connate; pistillode sometimes present. Disc intrastaminal, in female usually adnate to the receptacle and crenate; in male well developed and united with stamens. Ovary 3-locular. Style short. Drupe with abortively 1-locular, 1-seeded putamen.

Canarium strictum Roxb., Fl. Ind. 3: 138. 1832; Bedd., Fl. Sylv. t. 128. 1871; Gamble, Fl. Madras 172(123). 1915.

Lofty, evergreen, rufous trees. Leaflets 7, 8-16×4.5-7.5 cm, elliptic-oblong to lanceolate, crenate-serrate, tomentose beneath, glabrous above. Flower white. Disc crenate, hairy. Fruit to 3.5×2 cm, drupaceous, elliptic.

South W. India. Common in wet deciduous forests in upper Ghats. Resin fragrant. March-August. *CJS* 13799, 16579, *HFP* 1477.

COMMIPHORA N. Jacquin

Lateral leaflets often smaller. Inflorescence lateral, fasciculate. Flowers polygamous, 4-merous. Calyx urceolate or tubular, persistent. Stamens free, inserted on margin of disc, dimorphic. Disc erect, cupular. Ovary 2-3-celled; style short. Drupe fleshy, 2-4-valvate, with 1-3 bony seeds.

Commiphora caudata (Wight & Arn.) Engl. in A. & C. DC., Monogr. Phan. 4: 27. 1883; Gamble, Fl. Madras 171(122). 1915. *Protium caudatum* Wight & Arn., Prod. 176. 1834; Bedd., Fl. Sylv. t. 125. 1871.

Deciduous. Leaves 3-foliolate. Cymes on buttresses. Flowers brown.

South W. India. Occasional in dry deciduous forest of plains and hills. March. *CJS* 16471.

GARUGA Roxburgh

Deciduous. Leaflets often stipellate, crenate-serrate. Inflorescence crowded. Flowers polygamous, 5-merous. Calyx lobed, campanulate, pubescent. Petals inserted above mid-hypanthium. Stamens 10, free, equal; disc covering hypanthium. Ovary sessile, 4-locular; style elongate. Drupe globose, fleshy with 1-5 rugose 1-seeded pyrenes.

Garuga pinnata Roxb., Pl. Cor. t. 208. 1811; Wight. Ic. t. 1594. 1850; Bedd., Fl. Sylv. t. 118. 1871; Gamble, Fl. Madras 169(121). 1915.

Leaflets more than 10; basal ones reduced in size, glabrous with age. Flower yellow. Calyx pubescent; petals ovate, pubescent. Drupe black, 5-seeded.

India, Burma. Occasional in western plains, in and around Mallipatna. February. *CJS* 16724, *HFP* 2590.

94. ANACARDIACEAE

T. P. Ramamoorthy

Woody plants, often with resinous or caustic sap. Leaves alternate, estipulate, simple or pinnately compound, usually entire, pinnately veined. Inflorescence usually paniculate. Flowers bisexual or unisexual, regular, usually 5-merous; pedicel jointed. Sepals parted or toothed, persistent. Petals free, usually imbricate. Stamens usually twice as many as petals, inserted at base of disc; anthers versatile. Disc intrastaminal, often fleshy and annular. Ovary usually superior and 1-locular; ovule 1 per locule, subbasal-subapical, pendulous; styles 1-5, terminal, sometimes lateral, free or connate; stigma indistinct. Fruit indehiscent, drupaceous; pyrene 1.

1 Leaves compound.
2 Leaflets 3, coarsely serrate; plants armed.....**Rhus**
2 Leaflets 5-more, entire; plants unarmed.
3 Plants glabrous; petals valvate; leaflets with submarginal vein; ovary 4-5-locular .....**Spondias**
3 Plants stellately pubescent; petals imbricate; leaflets without submarginal vein; ovary 1-locular.....**Lannea**
1 Leaves simple.
4 Ovary inferior; petiole with 1-2 pairs of deciduous, spurlike appendages..... .....**Holigarna**
4 Ovary superior.
5 Styles 3-more.
6 Flowers unisexual; stamens as many as petals; styles 3.....**Semecarpus**
6 Flowers bisexual; stamens twice as many as petals; styles 5-6.....**Buchanania**
5 Style 1.

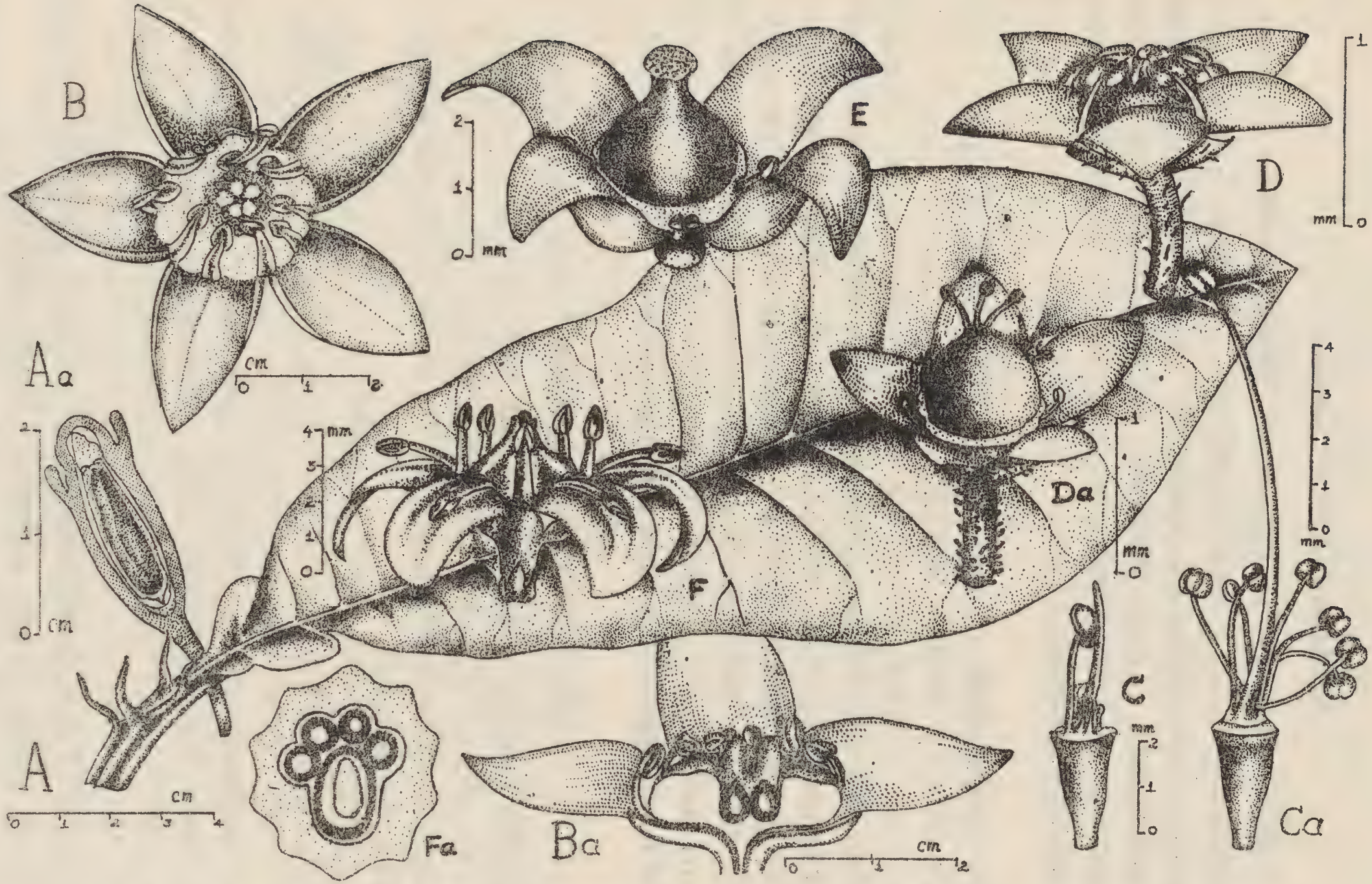


Fig. 74. ANACARDIACEAE. *A. Holigarna grahamii*: Leaf with petiolar appendages; *Aa*, fruit in section. *B. Spondias pinnata*: flower; *Ba*, same, in section. *C. Anacardium occidentale*: androecium and gynoecium in pistillate flower; *Ca*, androecium in staminate flower. *D. Rhus mysorensis*: male flower; *Da*, female flower. *E. Nothopegia beddomei*: female flower. *F. Buchanania lanzan*: flower; *Fa*, ovary in section.

7 Stamens twice as many as petals.....**Anacardium**
7 Stamens as many as petals or fewer.
8 Stamens all fertile; style terminal.....**Nothopegia**
8 1 stamen fertile; style lateral.....**Mangifera**

ANACARDIUM Linnaeus

Leaves simple. Flowers polygamous. Sepals partite, deciduous, imbricate; petals imbricate, eventually reflexed. Stamens 8-10, unequal, all basally connate into a tube; 1-2-perfect, the rest reduced to staminodes; pistillode rudimentary. Ovule subbasal; style lateral; stigma obscure. Fruit indehiscent, resinous, reniform, attached to a swollen, fleshy receptacle and tip of pedicel.

Anacardium occidentale L., Sp. Pl. 383. 1753; Bedd., Fl. Sylv. t. 163. 1871; Gamble, Fl. Madras 260(185). 1918.

Trees to 6 m. Leaves 10-14×4-8 cm, elliptic-obovate, rounded-emarginate, coriaceous. Panicle appressed-hairy. Calyx lobes unequal, hairy. Petals lanceolate, white, turning red with age. Enlarged receptacle and pedicel tip green, turning bright red, edible (called the Cashew apple).

A native of America, cultivated and naturalized. Common, planted on the plains and upper Ghats. January-March. The commercial product is the seed, usually known as the cashew nut. *CJS* 12197, 13123.

BUCHANANIA Sprengel

Trees. Leaves simple. Flowers bisexual. Calyx short, 3-5-dentate, imbricate. Disc fleshy, cupular, sometimes pilose. Ovary of 5-6, free carpels, one fertile, others reduced to styles; ovule subbasal, short; stigmas truncate. Drupe small, red.

1 Leaves pubescent beneath.....*B. lanzan*
1 Leaves glabrous beneath.....*B. axillaris*

Buchanania axillaris (Desr.) Ramam. *comb. nov.* *Mangifera axillaris* Desr. in Lam., Encycl. 3: 697. 1792. *Buchanania angustifolia* Roxb., Pl. Cor. t. 262. 1820; Wight, Ic. t. 101. 1839; Gamble, Fl. Madras 259(184). 1918.

Leaves 7-12×2.5-6 cm, linear-obovate, emarginate, glabrous. Panicle glabrous. Petals white, ovate, inflexed. Drupe globular.

South W. India. Common in open scrub and dry-wet deciduous forests of the plains. December-January. *CJS* 13562, *HFP* 161.

Buchanania lanzan Sprengel, J. Bot. (Schrader) 2: 234. 1800; Gamble. Fl. Madras 258(184). 1918. *Buchanania latifolia* Roxb., Fl. Ind. 2: 385. 1832; Bedd., Fl. Sylv. t. 165. 1871.

Petiole swollen, tomentose; blade 14-22×8.5-12 cm, broadly oblong, rounded-emarginate, pubescent, glaucous below. Panicle pubescent. Petals white, ovate. Disc villous. Drupe 1 cm, globose.

India, Burma. Common in dry-wet deciduous forests, often in open scrub in plains and upper Ghats. *CJS* 15792, *HFP* 1331.

HOLIGARNA Hamilton ex Roxburgh *nom. cons.*

Evergreen trees. Petiole usually with a pair of deciduous spur-like appendages; blade simple. Inflorescence sometimes racemose. Flowers polygamous. Calyx toothed, accrescent; petals valvate, cohering below, usually villous within. Stamens 5; pistillode none. Disc annular, fleshy, obscure in male flowers. Ovary inferior; ovule subapical; styles 3; stigmas capitate. Drupe resinous.

1 Leaves glabrous beneath ..... *H. ferruginea*
1 Leaves pubescent beneath ..... *H. grahamii*

Holigarna ferruginea Marchand, Rev. Anacard. 171. 1868; Gamble, Fl. Madras 268(191). 1918.

Tree to 12 m. Leaves 8-25×4.5-8.5 cm, obovate, with 10-14 pairs of nerves, glabrous, coriaceous. Panicle ferruginous. Petals white. Drupe elliptic, compressed, with acrid juice.

South W. India. Common in Ghats, in semi-evergreen forests. February-May. *CJS* 16367, 16678, 16940.

Holigarna grahamii (Wight) Kurz, J. Asiat. Soc. Bengal 42(2): 305. 1872; J. Hooker, Fl. Brit. India 2: 37. 1876; Gamble, Fl. Madras 268(191). 1918. *Semecarpus grahamii* Wight, Ic. t. 235. 1839. *Holigarna wightii* Balakrishnan, J. Bombay Nat. Hist. Soc. 63: 527. 1966, *nom. superfl.*

Tree to 16 m. Leaves 8-44×10-17 cm, broadly obovate, with the tip slightly narrowed to an acute point, with 22-26 pairs of nerves; midrib hairy on lower surface. Panicles brown-tomentose. Petals white.

South W. India. Common, in Ghats, in semi-evergreen forests. The acrid juice on contact with skin produces blisters and burns. December-February. *CJS* 12039, 12844.

Note: Wight's species is based on material from Peninsular India. Kurz (*l.c.*) made a new combination in *Holigarna* based on and citing Wight's species as a basionym and applied the new combination to specimens from Pegu. Hooker decided the Pegu material was a new species and, correctly, named Kurz's specimens as *Holigarna albicans, spec. nov.* He used the combination *Holigarna grahamii* for the South India material but, incorrectly attributed the combination to himself saying "Hook. f. (not of Kurz)." Balakrishnan (*l.c.*) has renamed Wight's species as *Holigarna wightii* and adopted *Holigarna grahamii* Kurz for the material from Pegu. According to our understanding Kurz did not publish a new species but made a new combination which was misapplied to material of another species. Our nomenclature follows this understanding.

LANNEA A. Richard *nom. cons.*

Leaves odd-pinnate. Inflorescence bracteate. Flowers polygamo-dioecious. Calyx 4-5-lobed, persistent, fused below, imbricate. Petals 4-5, eventually reflexed. Stamens inserted below margin of disc; filaments longer in male flowers. Ovary in male rudimentary, in female 1-locular; ovule subapical; styles 3-4, thick, truncate. Drupe compressed with persistent styles.

Lannea coromandelica (Houtt.) Merrill, J. Arnold Arbor. 19: 353. 1939. *Dialium coromandelicum* Houtt., Nat. Hist. ser. 2, 2: 39, t. 5, f. 2. 1774. *Odina wodier* Roxb., Fl. Ind. 2: 293. 1832; Wight, Ic. t. 60. 1838; Bedd., Fl. Sylv. t. 123. 1871; Gamble, Fl. Madras 263(187). 1918.

Deciduous tree to 8 m. Leaflets usually 7, 6-9 × 4-5 cm, ovate, rounded-truncate below, hairy but glabrous with age, drying reddish beneath. Inflorescence stellate-hairy. Sepals rounded. Petals rounded, yellow. Drupe fleshy, to 1.2 × 0.7 cm.

S. Asia, Indomalaysia. Common in wet deciduous and semi-evergreen forests in western plains and Ghats. February-May. *HFP* 1332, 1536.

MANGIFERA Linnaeus

Leaves simple. Panicles terminal. Flowers 4-5-merous, polygamodi-oecious; pedicels articulated. Calyx nearly free, deciduous, imbricate. Petals eventually reflexing, with 2-3 ridge-like, basally connate veins. Stamens usually 1 (-2), fertile, with 3 (-4) small staminodes, inserted on margin or at base of fleshy, usually lobed disc. Ovule subbasal; style subulate, eccentric; stigma indistinct. Drupe resinous, fleshy, with a compressed seed.

Mangifera indica L., Sp. Pl. 200. 1753; Bedd., Fl. Sylv. 162. 1871; Gamble, Fl. Madras 259(185). 1918.

Evergreen trees to 15 m. Leaves 9-22 × 3-6 cm, oblong-lanceolate, glabrous, coriaceous, with about 30 pairs of nerves. Sepals ovate, hairy on back. Petals oblong, white; disc 4-5-lobed. Staminodes often gland-tipped.

Tropics. Generally in cultivation, it is also found in a wild or semi-wild state in the western plains and Ghats. Economically an important plant, it yields the fruit universally known as the 'mango.' *CJS* 16177, 16316.

NOTHOPEGIA Blume *nom. cons.*

Note: The present treatment is rather tentative as the taxonomy of the genus is unsatisfactory with no constant characters for segregating the various species. It is felt that both fruiting and flowering materials are essential with well documented field observations for a proper understanding of the genus. A revision is most desirable.

Usually shrubs. Leaves simple. Racemes axillary, subsimple. Flowers polygamous, 4-merous. Calyx lobed, persistent. Stamens 4, inserted on margin of disc; pistillode rudimentary. Ovule subapical; style short. Drupe tipped by style.

1 Young twigs, petioles and petals villous.....*N. travancorica*
1 Young twigs, petioles and petals glabrous.
2 Fruit apiculate.....*N. heyneana*
2 Fruit depressed, not apiculate.
3 Staminal filaments villous.....*N. beddomei*
3 Staminal filaments glabrous.....*N. racemosa*

Nothopegia beddomei Gamble, Fl. Madras 265(189). 1918. *Nothopegia colebrookeana* auct. non Blume, 1851: Bedd., Fl. Sylv. t. 164. 1871.

Leaves 10-15×3-4.5 cm, lanceolate, rounded below, glabrous, with 20-29 pairs of nerves. Petals white, reflexed, spatulate. Staminal filaments villous. Fruit globose, depressed at tip, striate, red.

South W. India. Common in Ghats, usually along streams and in shade of large trees in wet deciduous and semi-evergreen forests. February-June. *CJS* 13603, 13884.

Nothopegia heyneana (J. Hooker) Gamble, Fl. Madras 265(189). 1918. *Nothopegia colebrookeana* var. *heyneana* J. Hooker, Fl. Brit. India 2: 40. 1876.

Leaves 10-14×2.5-4.5 cm, elliptic-lanceolate, rounded below, glabrous. Sepals ovate; petals white. Staminal filaments villous. Drupe globose, distinctly apiculate, striate.

Peninsular India. Common in Ghats in shade of semi-evergreen forests. December-May. *CJS* 11723, 15801.

Nothopegia racemosa (Dalz.) Ramam. *comb. nov.* *Glycycarpus racemosus* Dalzell, J. Asiat. Soc. Bombay 3: 69. 1849. *Nothopegia dalzellii* Gamble, Fl. Madras 265(189). 1918, *nom. illeg.*

Leaves 10-20×3.5-5.5 cm, oblong-lanceolate, rounded below, with about 26-32 pairs of nerves. Raceme elongate. Petals white. Staminal filaments glabrous.

South W. India. Occasional, in lower Ghats near streams. April-May. *CJS* 16811.

Nothopegia travancorica Bedd. ex J. Hooker, Fl. Brit. India 2: 40. 1876; Gamble, Fl. Madras 265(189). 1918.

Enations hairy. Leaves 10-22×2.5-6.5 cm, oblong-lanceolate, with about 25-35 nerves, somewhat membranous. Petals villous, white. Staminal filaments hairy. Drupe apiculate.

S. India. Common in Ghats, in shade usually near streams in semi-evergreen forests. September-November. *CJS* 11428, *HFP* 883.

Note: *CJS* 16767 from Panorama Point of Bisle Ghat has obovate leaves, and a rufous-hairy inflorescence axis. This may be *N. colebrookeana* Blume.

RHUS Linnaeus

Leaves odd-pinnate. Flowers polygamous, 4-6-merous. Calyx lobes almost free, persistent. Stamens 4-10; anthers empty in female flowers; pistillode none in male flowers. Disc annular. Ovules subbasal; styles 3, often connate below.

Rhus mysorensis G. Don, Gen. Sys. 2: 74. 1832; Heyne ex Wight & Arn., Prodr. 172. 1834; Gamble, Fl. Madras 264(188). 1918; Sprague, Bull. Misc. Inform. 315. 1925.

Spinous shrubs to 5 m. Leaves trifoliate; the terminal largest, to 2.5×1.5 cm, obovate, rounded below, 2-7-crenate toward tip, glabrous with age, coriaceous, drying brown below. Panicle terminal; peduncle hairy. Sepals acute, hairy. Petals ovate, yellow. Stamens 5; styles 3, two shorter, connate below. Drupe pea-sized, turning white.

Western India. Common in open scrub in the eastern plains at Belvathally and Ramanahalli. September-December. *CJS* 11994, *HFP* 1087, 1088.

Note: Some authors consider *Rhus mysorensis* G. Don, to be a synonym of *Rhus sinuata* Thunb. (*The Wealth of India* 9: 20. 1972).

SEMECARPUS Linnaeus f.

Leaves simple. Panicles lateral or terminal. Flowers unisexual. Calyx partite, accrescent. Stamens smaller in female; pistillode none. Ovule subapical; styles 3; stigmas capitate. Drupe or nut reniform, supported by fleshy hypocarp.

Semecarpus anacardium L. f., Suppl. 182. 1781; Wight, Ic. t. 558. 1842; Bedd., Fl. Sylv. t. 166. 1871; Gamble, Fl. Madras 267(190). 1918.

Tree to 8 m. Leaves 20-35×10-16 cm, broadly obovate-oblong, rounded-acute at tip, truncate-cordate at base, glabrous above, silky white-pubescent beneath, glabrous with age. Panicle small, hairy. Flowers yellowish. Disc villous. Drupe with plenty of acrid juice.

S. Asia, N. Australia. Common in dry-wet deciduous forests in the plains. June-September. *CJS* 13995, 15880. The marking nut tree.

SPONDIAS Linnaeus

Leaves odd-pinnate; leaflets with an intramarginal nerve. Panicle terminal. Flowers polygamous, 4-5-merous. Calyx deciduous, partite. Disc fleshy, cupular, crenate. Ovary 4-5-locular; ovule 1 per locule, pendulous; styles 4-5, short. Drupe 1-5-locular; seeds pendulous.

Spondias pinnata (L. f.) Kurz, Pegu Report A. 44. 1875. *Mangifera pinnata* L. f., Suppl. 156. 1781. *Spondias mangifera* Willd., Sp. Pl. 2: 754. 1799; Bedd., Fl. Sylv. t. 169. 1872; Gamble, Fl. Madras 261(186). 1918.

Deciduous tree to 8 m. Leaflets 6-10×2.5-6 cm, broadly elliptic, rounded below, with 20-25 pairs of closely parallel veins, all joining an intramarginal vein. Flowers white. Drupe fleshy, rounded, to 2.5×2 cm.

Tropical Asia. Common in wet deciduous and semi-evergreen forests in western plains and Ghats. January-August. *CJS* 16566, 14437, *HFP* 1430.

95. RUTACEAE

K. N. Gandhi

Usually woody. Leaves usually alternate; stipules 0; blade usually compound, entire, pellucid-dotted; venation pinnate. Inflorescence usually cymose and axillary; bracteoles distinct or not. Flowers usually bisexual, regular and 4-5-merous, often pedicelled. Calyx lobes usually connate below, imbricate. Petals free, usually imbricate. Stamens usually twice the number of petals; filaments inserted around a distinct, crenulate or lobed disc, free or connate; anthers dorsifixed. Pistil of 4-5 usually connate carpels, superior; ovules usually 2, superposed; styles 1-many, usually connate, often inconspicuous; stigma entire or lobed. Fruit various.

1 Plants armed.
2 Leaves 1-foliolate.
3 Flowers solitary or fascicled; pedicel relatively stout; disc columnar; stamens 8-10 ..... **Paramignya**
3 Flowers in short cymes; pedicels slender; disc annular or cupular; stamens 6-8.... ..... **Atalantia**
2 Leaves 3-many-foliolate.
4 Leaflets 5 or more, pinnately arranged.
5 Wings of petiole 5-8 mm broad; stamens 8-10..... **Naringi**
5 Wings of petiole inconspicuous or absent; stamens 3-5..... **Zanthoxylum**

Fig. 75. RUTACEAE. *A. Luvunga sarmentosa*: flowering branch. *B. Aegle marmelos*: flower without petals and sepals; *Ba,* ovary in cross section. *C. Vepris bilocularis*: pistillate flower; *Ca,* staminate flower. *D. Clausena dentata*: flower in vertical section. *E. Chloroxylon swietenia*: capsule. *F. Atalantia wightii*: berry. *G. Paramignya monophylla*: flowering twig. *H. Acronychia pedunculata*: ovary in cross section.

4 Leaflets 3, digitately arranged.
6 Plants armed with scattered prickles; flowers unisexual.....**Toddalia**
6 Plants armed with axillary thorns; flowers bisexual.
7 Leaflets coriaceous; stamens 8-10; fruit rough.....**Luvunga**
7 Leaflets chartaceous; stamens more than 20; fruit smooth.....**Aegle**
1 Plants unarmed.
8 Leaves 1-foliolate.
9 Petiole to 5 mm long; inflorescence less than 3 cm long.....**Atalantia**
9 Petiole exceeding 2 cm; inflorescence more than 8 cm.....**Acronychia**
8 Leaves 3-many-foliolate.
10 Leaflets digitate; flowers unisexual.
11 Leaves opposite; stamens as many as petals; ovary partite; fruit dehiscent..**Euodia**
11 Leaves alternate; stamens twice the number of petals; ovary entire; fruit indehiscent.....**Vepris**
10 Leaflets pinnate; flowers bisexual.
12 Leaves even-pinnate; leaflets glaucous beneath; fruits capsular.....**Chloroxylon**
12 Leaves odd-pinnate; leaflets not glaucous beneath; fruit a berry.
13 Anthers glandular; style persistent.....**Glycosmis**
13 Anthers eglandular; style deciduous.
14 Leaflets 3-7; alternating stamens longer; ovary entire, glabrous.....**Murraya**
14 Leaflets 7-17; stamens all equal; ovary grooved or papillose.....**Clausena**

ACRONYCHIA J. &. G. Forster *nom. cons.*

Note: *Jambolifera* L. is an earlier name for *Acronychia* which had already been conserved against *Cunto* Adanson. Dr. Thomas Hartley (CSIRO, Australia) has recommended conservation of *Acronychia* against *Jambolifera* also.

Leaves subopposite, usually 1-foliolate. Corymbs in upper axils. Flowers polygamous, usually 4-merous. Calyx short, persistent. Petals linear-lanceolate, valvate. Stamens dimorphic, inserted below the 8-ridged, tomentose disc; filaments subulate. Ovary inserted on the hollow top of the disc, 4- (5-) locular, with 2 superposed ovules per locule; style erect; stigma 4-5-grooved. Fruit a drupe or 4-valved capsule.

Acronychia pedunculata (L.) Miq., Fl. Ind. Bat. Suppl. 532. 1861; M. A. Rau, Bull. Bot. Surv. India 10 (Suppl. No. 2): 18. 1968. *Jambolifera pedunculata* L., Sp. Pl. 349. 1753. *Acronychia laurifolia* Blume, Cat. Gew. Buitenz. 63. 1823; Gamble, Fl. Madras 152(108). 1915; Backer & Bakh. f., Fl. Java 2: 101. 1965.

Small, evergreen trees. Leaf blade elliptic-lanceolate, glabrous, to 10×6 cm, chartaceous. Peduncle 8-15 cm long. Flowers many. Petals hairy within toward base, white. Ovary pubescent. Drupe oblong-globose, apiculate, to 0.6 cm long.

Indomalaysia. Scattered in upper Ghats. May-November. *CJS* 12378, 14416.

Note: We have followed Dr. Hartley in considering *A. laurifolia* as a synonym of *A. pedunculata.*

AEGLE Correa *nom. cons.*

Spinous trees. Leaves 3-foliolate; leaflets petiolulate, entire or crenulate, membranous. Panicles axillary. Flowers pedicelled. Calyx campanulate, toothed, deciduous. Stamens many. Disc inconspicuous. Ovary ovoid, 8-many-locular; ovules many per locule, 2-seriate; style short, deciduous. Berry large, smooth and woody outside, many-locular and many-seeded.

Aegle marmelos (L.) Correa, Trans. Linn. Soc. London 5: 223. 1800; Wight, Ic. t. 16. 1838; Bedd., Fl. Sylv. t. 161. 1871; Gamble, Fl. Madras 161(115). 1915. *Crateva marmelos* L., Sp. Pl. 444. 1753.

Deciduous, medium trees. Spines 2-3 cm long. Leaflets ovate, rounded at base, glabrous or grey-pubescent, terminal larger, to 8×4 cm. Peduncle 3-5 cm long. Pedicels articulate. Flowers 5-merous. Petals greenish-white. Ovary glabrous. Berry to 8×6 cm, yellowish-brown.

Indomalaysia. Occasional in dry deciduous plains. April-August. Pulp edible. *CJS* 16888, *HFP* 2888.

ATALANTIA Correa *nom. cons.*

Leaves 1-foliolate, shortly petiolate, entire. Inflorescence short, axillary. Flowers pedicelled, 3-5-merous. Calyx lobed, persistent. Petals free or connate with stamens. Disc annular or cupular. Ovary subglobose, 2-4- (3-5-) locular; ovules 1 or 2 per locule, collateral; style erect, deciduous; stigma capitate. Berry subglobose, coriaceous.

Atalantia wightii Tanaka, Bull. Soc. Bot. France 75: 714. 1928; Gamble, Fl. Madras 114. 1956 (not in original edition of 1915).

Evergreen shrubs. Spines few. Blade elliptic-lanceolate, often slightly retuse, rounded at base, to 15×6 cm, glabrous, olive-green. Inflorescence a cyme. Flowers 4-merous. Petals free, white. Stamens 8, free; filaments subequal. Ovary glabrous; locules with 2 ovules. Berry yellow, to 2.5 cm across.

Western Ghats. Occasional in upper Ghats. January-May. *CJS* 13404, 16534.

Note: The thorns are absent in many of our herbarium specimens.

CHLOROXYLON A. P. de Candolle *nom. cons.*

Note: This genus with its capsular fruits and alate seeds, was included in Meliaceae by Bentham & Hooker although it has glandular-punctate leaves. Some place this genus in the *Flindersiaceae.*

Trees; enations sparsely-white pubescent. Leaves often clustered

toward apex, odd-pinnate; leaflets many, alternate, petiolulate, oblique. Inflorescence a panicle. Flowers pedicelled. Calyx partite, deciduous. Petals clawed, spreading. Disc thick, 10-lobed, pubescent. Stamens dimorphic, placed in depressions of the disc. Ovary partly immersed in the disc, pubescent, 3-lobed, 3-locular; ovules 8 per locule, axillary; style short; stigma obscurely 3-lobed. Capsule loculicidally 3-valved; seeds alate above.

Chloroxylon swietenia DC., Prodr. 1: 625. 1824; Bedd., Fl. Sylv. t. 11. 1869; Gamble, Fl. Madras 152(109). 1915. *Swietenia chloroxylon* Roxb., Pl. Cor. t. 64. 1796.

Leaf axis 13 cm long; leaflets in 12-15 pairs, oblong-lanceolate, obtuse at apex, oblique at base, to 3×1 cm, membranous. Peduncle 6-10 cm long, branches short. Flowers white. Capsule ovoid or oblong, to 3×1.5 cm.

Western Ghats, sometimes cultivated elsewhere. Locally frequent at Nagpuri (dry deciduous forest). March-July. *HFP* 1502, 2824.

CLAUSENA N. Burman

Unarmed. Leaves odd-pinnate; leaflets alternate. Flowers 4-5-merous, bisexual. Calyx short, often deeply partite. Disc stipe-like. Stamens twice the number of petals, inserted around the disc; filaments subulate, dilated below. Ovary 2-5-locular, with 2 ovules per locule. Fruit a berry.

1 Inflorescence axillary; flowers 4-merous; leaflets acuminate.....*C. dentata*
1 Inflorescence terminal; flowers 5-merous; leaflets subacute.....*C. indica*

Clausena dentata (Willd.) Roemer, Syn. Hesper. 44. 1846. *Amyris dentata* Willd., Sp. Pl. 2: 337. 1799. *Clausena willdenowii* Wight & Arn., Prodr. 96. 1834; Wight, Ic. t. 14. 1838; Gamble, Fl. Madras 155(110). 1915.

Small trees. Leaflets 11-17, elliptic-ovate, acuminate, oblique at base, upper ones largest, to 10×3.5 cm. Inflorescence axillary, racemose. Flowers 4-merous, white. Ovary 4-grooved, with obscure glands, 4-locular; ovules superposed; style thick. Berry globose, to 1.5 cm across, white with age.

India, Sri Lanka. Scattered in upper Ghats. March-June. *CJS* 13180, 16739.

Clausena indica (Dalzell) Oliver, J. Linn. Soc., Bot. 5 (Suppl. 2): 36. 1861; Gamble, Fl. Madras 155(110). 1915. *Piptostylis indica* Dalzell, Hooker's J. Bot. Kew Gard. Misc. 3: 33, t. 2. 1851.

Small trees. Leaflets 7-11, elliptic-lanceolate, subacute at both ends, to 6×2.2 cm. Inflorescence terminal, corymbose. Flowers 5-merous, pale white. Ovary papillose, 2-5-locular; ovules collateral. Berry globose, to 1 cm across.

Western Ghats, Sri Lanka. Collected once in fruit from semi-evergreen forest of lower Bisle Ghat on March 11, 1970. *CJS* 16528.

EUODIA J. & G. Forster

Unarmed, usually dioecious. Leaves opposite, 1-many-foliolate. Inflorescence an axillary, panicled cyme. Flowers 4-5-merous. Petals ovate-oblong. Disc conspicuous, grooved. Stamens or staminodes inserted below disc; filaments subulate; anthers ovoid, medifixed. Pistillode short. Ovary usually 4-partite, woolly; each lobe 1-locular with 2 superposed or collateral ovules; style basal; stigma obscurely 4-lobed. Fruit of four 2-valved cocci; endocarp horny, separating.

Euodia lunu-akenda (Gaertner) Merrill, Philipp. J. Sci. Bot. 7: 378. 1913 ('*Evodia lunar-akenda*'); Gamble, Fl. Madras 148 (105). 1915 ('*Evodia*'). *Fagara lunu-akenda* Gaertner, Fruct. 1: 334. t. 68, f. 9. 1788. *Zanthoxylum triphyllum* Wight, Ic. t. 204. 1839 ('*Zanthoxylon*').

Trees. Leaves digitately trifoliolate; petiole to 10 cm long; leaflets elliptic-oblong, acute-acuminate, to 22×10 cm. Inflorescence minutely pubescent. Flowers 4-merous, greenish-white. Cocci pale brown, 1-seeded; seed black.

India to Continental South E. Asia. Occasional in upper Ghats. July-November. *CJS* 14598, *HFP* 318.

GLYCOSMIS Correa

Leaves usually odd-pinnate; leaflets alternate, slightly serrulate, chartaceous. Inflorescence a panicle, usually axillary. Flowers 5-merous, sessile. Filaments subulate but dilated below; anthers often with apical or dorsal gland. Disc stipitate. Ovary on the disc, ellipsoid, 2-5-locular; ovule 1 per locule, pendulous; style very short, persistent; stigma broad and flat. Berry globular or ellipsoid, 1-3-seeded.

1 Inflorescence equaling or longer than leaf rachis. Ovary ovoid, sessile; leaflets crenate-serrate. Fruit glandular-mammillate ..... *G. arborea*
1 Inflorescence short. Ovary fusiform, stalked; leaflets entire. Fruit glandular-pitted ..... *G. mauritiana*

Glycosmis arborea (Roxb.) DC., Prod. 1: 538. 1824; [incorrectly given as *G. arborea* (Roxb.) Correa by Narayanaswami, Rec. Bot.

Surv. India 14(2): 20. 1940]. *Limonia pentaphylla* Retz., Obs. Bot. 5: 24. 1788 [non *Glycosmis pentaphylla* (Roxb.) DC.] *Limonia arborea* Roxb., Pl. Cor. t. 85. 1798. *Glycosmis pentaphylla* auct. non (Roxb.) DC.: Tanaka, Bot. Not. 159. 1928. *Glycosmis cochinchinensis* auct. excl. *Tolnifera cochinchinensis* Lour., 1790: Pierre ex Engl. in Engl. & Prantl, Pflanzenfam. 3(4): 185. 1896; Gamble, Fl. Madras 153(109). 1915.

Glabrescent shrubs. Leaves 3-5-foliolate; leaflets oblong-lanceolate, to 16×5 cm. Flowers white. Ovary covered with mammillary glands, 5-locular. Berry subglobose, glandular-mammillate, to 0.5 cm across.

India, Burma. Frequent across the Ghats. October-January. *CJS* 10166, 16014.

Note: Much confusion surrounds the type species of *Glycosmis* Correa (*Limonia arborea* Roxb.) and we quote from the summary of Brizicky (*J. Arnold Arbor.* 18: 91. 1962): "Tanaka's assumption of the conspecificity of *Limonia pentaphylla* Retzius (1788) with *L. arborea* Roxb., based on the presumed authentic type specimen of the former seems correct, since *G. pentaphylla* DC., based on *Limonia pentaphylla* sensu Roxb. (1798), not of Retzius (1788), cannot be applied to *Limonia pentaphylla* Retz. The next available name for the latter species is *G. arborea* (Roxb.) DC. The correct name for *G. pentaphylla* DC., is *G. mauritiana* (Lam.) Tanaka. The third species involved in the nomenclatural confusion was *G. cochinchinensis* (Lour.) Pierre ex Engler, which was based on *Tolnifera cochinchinensis* Loureiro (1780). Merrill's notes on the latter species, quoted by the present author, suggest a close relationship of Loureiro's species with *G. parviflora* (Sims) Little (*G. citrifolia* (Willd.) Lindl.), rather than with *G. arborea*." It should also be noted that Correa did not make any combinations in his genus.

Glycosmis mauritiana (Lam.) Tanaka, Bull. Soc. Bot. France 75: 708. 1928; Brizicky, J. Arnold Arbor. 18: 90. 1962. *Limonia mauritiana* Lam., Encyl. 3: 517. 1792. *Limonia pentaphylla* auct. non Retz., 1788: Roxb., Pl. Cor. t. 84. 1798. *Glycosmis pentaphylla* DC., Prod. 1: 538. 1824 [incorrectly given as *G. pentaphylla* (Retz.) Correa by Narayanaswami, Rec. Bot. Surv. India. 14(2): 12. 1941]. *Glycosmis triphylla* Wight, Bot. Misc. 3: 298, t. 39. 1833; Ic. t. 167. 1839.

Medium trees. Leaves 5-more-foliolate; leaflets ovate-lanceolate, acuminate, rounded at base, to 12×4-6 cm, coriaceous. Inflorescence brown-pubescent. Flowers white (slightly smaller than the previous species). Ovary eglandular, sparsely pilose, 5-locular. Berry ovoid, to 1 cm across, yellow.

S. India, Sri Lanka. Fairly common in upper Ghats. January-May. *CJS* 16756, *HFP* 2698.

LUVUNGA Hamilton ex Wight & Arnott

Glabrous, armed, climbing shrubs. Leaves digitately trifoliolate; leaflets petiolulate, entire, coriaceous. Inflorescence axillary. Flowers pedicelled. Calyx cupular, entire or lobed, 6-toothed, persistent. Stami-

nal filaments free or connate below. Disc annular or cupular. Ovary shortly stalked, 2-4-locular; style erect, short, deciduous; stigma capitate. Berry 1-3-seeded.

Luvunga sarmentosa (Bl.) Kurz, J. Asiat. Soc. Bengal 39(2): 69. 1870; Backer & Bakh. f., Fl. Java 2: 105. 1965. *Triphasia sarmentosa* Blume, Bijd. 1: 132. 1825. *Luvunga eleutherandra* Dalzell, Hooker's J. Bot. Kew Gard. Misc. 2: 258. 1850; Gamble, Fl. Madras 157(112). 1915.

Thorns 3 cm long. Leaflets elliptic-oblong, acuminate, rounded at base, to 10×5 cm. Peduncle 2-3 cm long. Flowers white. Berry pitted with glands, to 3 cm across.

Indomalaysia. Frequent in upper Ghats. All seasons. *CJS* 12549, 16385.

MURRAYA Linnaeus *nom. cons.*

Unarmed. Leaves odd-pinnate; leaflets alternate. Inflorescence cymose, racemose or flowers solitary. Flowers bisexual, 5-merous. Calyx deeply partite. Petals oblong. Disc erect. Stamens 10; filaments alternately longer and shorter, subulate; anthers short, basifixed. Ovary 2-locular, with 1 or 2 superposed ovules per locule; stigma dilated, 2-fid. Fruit a berry.

Murraya paniculata (L.) Jack., Mal. Misc. 1: no. 5, 31. 1820; Sant., Fl. Khandala ed. 3, 33. 1967. *Chalcas paniculata* L., Mant. 68. 1767. *Murraya exotica* L., Mant. Alt. 563. 1771 ('*Murraea*'); Wight, Ic. t. 96. 1838; Gamble, Fl. Madras 155(111). 1915.

Shrubs or small trees. Leaflets 3-7, elliptic-ovate, acuminate, often oblique at base, to 6×3 cm. Flowers axillary and solitary or in terminal cymes. Petals white, to 2 cm long, scented. Ovary hirsute. Berry red, elliptic, apiculate; seeds woolly.

Indomalaysia. Occasional in upper Ghats. May-August. *CJS* 14472, *HFP* 93.

Note: One collection (*CJS* 16648) differs from *M. paniculata* by possessing small (6 mm long), greenish-yellow petals and glabrous ovary.

NARINGI Adanson

Erect shrubs or small trees, armed with axillary spines. Leaves odd-pinnate; leaf axis distinctly winged; leaflets sessile, crenulate, chartaceous. Inflorescence a raceme or cyme, on old wood. Flowers pedicelled. Disc pulvinate. Ovary oblong, 4-5-locular; ovule 1 per locule; style short, thick; stigma capitate. Berry globose.

Naringi crenulata (Roxb.) Nicolson, *comb. nov.* *Limonia crenulata* Roxb., Pl. Cor. t. 86. 1798; Gamble, Fl. Madras 157(112). 1915. *Hesperethusa crenulata* (Roxb.) Roemer, Syn. Monogr. 1: 38. 1846; Backer & Bakh. f., Fl. Java 2: 105. 1965. *Limonia acidissima* auct. non L., 1762: J. Hooker, Fl. Brit. India 1: 507. 1875.

Small trees. Spines solitary or geminate, 1.5-3 cm. Petiole and rachis articulate; leaflets in 2-4 pairs, ovate or obliquely oblong, to 3×1.5 cm. Raceme subumbellate, short, pubescent, often leafy. Flowers 4-merous, white. Ovary 4-locular. Berry 1.5 cm across, bluish-black.

Indomalaysia. Rare; collected only in leaf both in lower Bisle Ghat and dry scrub. *CJS* 11996, 16015.

Note: The proposal to conserve *Hesperethusa* Roemer (*Taxon* 18: 467. 1969) failed (*Taxon* 19: 816. 1970).

PARAMIGNYA Wight

Erect or climbing shrubs, often armed with axillary, recurved thorns. Leaves 1-foliolate, entire, subcoriaceous. Flowers solitary or fascicled, axillary, long-pedicelled. Calyx cupular, lobed, small. Disc stipitiform. Ovary shortly ellipsoid, tomentose, 3-5-locular; ovules 1-2 per locule; style elongate, finally deciduous; stigma capitate. Berry ovoid or subglobose, coriaceous outside, 1-5-seeded.

Paramignya monophylla Wight, Ill. 1: 109, t. 42. 1840; Gamble, Fl. Madras 158(113). 1915.

Evergreen climbers. Thorn 1 cm long. Petiole 1 cm long; blade ovate-lanceolate, rounded at base, to 8×4 cm, glabrous. Penducle to 1.2 cm long, white-pubescent. Calyx white-pubescent; lobes broad and obtuse. Petals white, to 1.5×0.4 cm, longer than stamens and style. Berry yellow.

India, Burma, Sri Lanka. Occasional in upper Ghats. February-May. *CJS* 16380, 16939.

TODDALIA A. Jussieu *nom. cons.*

Erect or climbing shrubs, usually armed with scattered, recurved prickles, dioecious. Leaves digitately trifoliolate; leaflets sessile, coriaceous. Inflorescence a cyme or panicle. Flowers pedicelled, abortively unisexual, 2-5-merous. Calyx small, campanulate, toothed-parted. Petals imbricate or valvate. Stamens 4-5; pistillode simple or 4-partite. Staminodes in pistillate flower 4-5; ovary usually shortly stalked, oblong or globose, 2-7-locular; style short or 0; stigma capitate. Fruit fleshy or coriaceous; seeds angular, reniform.

Toddalia asiatica (L.) Lam., Ill. 2: 116. 1797. *Paullinia asiatica* L., Sp. Pl. 365. 1753.

1 Leaflets more than 2 cm broad; fruits hardly lobed. Stout climbers.....var. *floribunda*
1 Leaflets less than 2 cm broad; fruits distinctly lobed. Slender climber....var. *gracilis*

var. **floribunda** Gamble, Fl. Madras 151(107). 1915.

Scandent shrubs with stout branches, with prickles on the stem. Leaflets obovate-ovate, to 12×4 cm, coriaceous. Peduncle 4-12 cm long. Flowers in umbellules, white. Berry globular, to 0.8 cm across, pitted, yellow with age.

S. India. Frequent in upper Ghats. All seasons. *CJS* 14471, 16194.

var. **gracilis** Gamble, Fl. Madras 151(107). 1915.

Scandent, slender shrubs, with prickles on the stem, petiole and often on the leaflets. Leaflets obovate or oblong, acute, to 3×1.5 cm. Peduncle 4-6 cm long. Flowers white. Berry lobed, to 0.5 cm long.

S. India. Common in scrub. All seasons. *HFP* 1843, 2043.

VEPRIS Commerson ex A. Jussieu

Unarmed, erect or climbing shrubs or trees, dioecious. Leaves alternate, 1-3-foliolate; leaflets petiolulate, entire, subcoriaceous, large. Inflorescence a panicle, axillary or terminal. Flowers small, subsessile. Calyx minute. Petals 2 or 4, ovate-lanceolate. Stamens in staminate flower inserted beneath the disc, free; filaments flat; anthers minute, ovoid. Disc ridged. Pistillode 2-lobed. Rudimentary stamens present in pistillate flower. Ovary globular, 2 or 4-locular, each with 2 collateral ovules; styles 0; stigma peltate. Berry oblong or globose, 2-4-seeded, 2-grooved outside.

Vepris bilocularis (Wight & Arn.) Engl. in Engl. & Prantl, Pflanzenfam. 3(4): 178. 1896; Gamble, Fl. Madras 151(108). 1915. *Toddalia bilocularis* Wight & Arn., Prodr. 149. 1834; Bedd., Ic. t. 167. 1874.

Petiole 5-10 cm long; petiolules 2 cm long; leaflets 3, digitate, elliptic-oblong, acuminate, to 20×7 cm, glabrous. Peduncle 5-8 cm long. Flowers many. Petals 2-3, white. Stamens 6. Berry 1 cm long, 2-seeded.

South W. India. Occasional in Shiradi Ghat. May-August. *HFP* 88, 416.

ZANTHOXYLUM Linnaeus

Note: Hartley (*J. Arnold Arbor.* 47: 171-221. 1966) has merged *Fagara* L. (*nom. cons.*) into the priorable *Zanthoxylum* L. against which *Fagara* is not conserved.

Erect or climbing shrubs or trees, often armed with stout prickles.

Leaves odd-pinnate; leaflets petiolulate, entire or crenate, often oblique, chartaceous. Inflorescence a terminal or axillary panicle or cyme. Flowers polygamous, pedicelled. Calyx 3-5-fid. Petals 3-5, ovate, rarely 0. Male flower with 3-5-stamens; disc inconspicuous; pistillodes 1-5. Female flower with 0 or squamiform staminodes; disc very short; pistils 1-5, free or connate, each with 2, often collateral, ovules; styles sublateral, free with entire stigmas or connate with 2-5-lobed stigma. Cocci of globose, dry or drupaceous, 1-seeded carpels.

Zanthoxylum rhetsa (Roxb.) DC., Prodr. 1: 728. 1824; Gamble, Fl. Madras 150(107). 1915; Backer & Bakh. f., Fl. Java 3: 654. 1968. *Fagara rhetsa* Roxb., Fl. Ind. 1: 438. 1820. *Fagara budrunga* Roxb., Fl. Ind. 1: 437. 1820; Sant., Fl. Khandala ed. 3, 32. 1967. *Zanthoxylum budrunga* (Roxb.) DC., Prodr. 1: 728. 1824.

Large deciduous tree with scattered, conical prickles on the trunk and branches. Leaf axis unarmed, not winged; leaflets in 5-7 pairs, opposite, entire, ovate-lanceolate, caudate, oblique, to 9×4 cm, glabrous. Inflorescence a terminal cyme. Flowers 4-merous, yellow. Cocci tubercled, 0.5 cm long.

Indomalaysia. Rare in upper Ghats. June-August.

Note: The corky, cream-colored bark covered with conical spines is striking. *Fagara budrunga* and *F. rhetsa* are commonly regarded as conspecific, both published simultaneously. The first author to unite them was apparently Guillaumin (*Fl. Gen. Indoch.* 1: 639. 1911) who accepted *Zanthoxylum rhetsa* and cited *Z. budrunga* in synonymy. Haines (*Bot. Bihar & Orissa* 2: 160. 1921) later accepted *Z. budrunga* and made *Z. rhetsa* a synonym, presumably in ignorance of Guillaumin's earlier reduction. Under Article 57, the earliest reduction must be adopted.

* * *

Several species of *Citrus* L. are cultivated, the commonest one is *Citrus reticulata* Blanco, the 'Coorg Orange.'

96. MELIACEAE

T. P. Ramamoorthy

Usually woody. Leaves alternate, estipulate, usually odd-pinnately compound with generally entire leaflets. Inflorescence usually paniculate and axillary. Flowers usually bisexual, regular; bracteoles absent. Sepals 3-6, mostly imbricate. Petals 3-6, sometimes adnate with the staminal tube below, usually imbricate. Disc present or absent. Stamens generally twice as many as petals and usually connate into a staminal column. Ovary superior, sometimes adnate to or sunk in disc, 2-5-locular;

locules usually 2-locular, axillary and superposed; style simple; stigma sometimes sessile, usually capitate or lobed. Fruit capsular, baccate or drupaceous; seed sometimes winged, often arillate.

1 Staminal filaments free or only fused below.
2 Stamens 5, isomerous.....**Toona**
2 Stamens 8-10, twice as many as petals.
3 Leaves 3-foliolate.....**Walsura**
3 Leaves 5-more-foliolate.
4 Leaflets toothed; berry 5-seeded; panicle less than half the leaf length.....**Cipadessa**
4 Leaflets entire; drupe 1-seeded; panicle equaling or longer than leaf length.....**Trichilia**
1 Staminal filaments united throughout.
5 Stigma subsessile.
6 Petals 4-5.....**Aglaia**
6 Petals 3.....**Aphanamixis**
5 Stigma on an elongate style.
7 Leaves 2 (-3)-pinnate.....**Melia**
7 Leaves once pinnate.
8 Fruit 1-locular, a 1-seeded drupe; leaves usually even-pinnate.....**Azadirachta**
8 Fruit 2-5-locular, a 2-10-seeded capsule; leaves odd-pinnate.
9 Inflorescence 1-few-flowered; flowers to 4 cm long; leaflets opposite.....**Munronia**
9 Inflorescence many-flowered; flowers less than 2 cm long; leaflets alternate.....**Dysoxylum**

AGLAIA Loureiro *nom. cons.*

Evergreen trees. Flowers bisexual or polygamodioecious, (4-) 5-merous. Petals free or shortly adnate to staminal tube. Disc obscure. Stamens 5-10; staminal column short-globose, entire or dentate. Ovary 1-3-locular; stigma subcapitate, sessile. Berry 1-3-seeded with a coriaceous pericarp; seed with or without aril.

1 Stamens 10, in two rows; the upper slightly exserted.....*A. anamallayana*
1 Stamens 5-7, in one row, all included.
2 Inflorescence glabrous, not rufous scaly; leaflets to 6 pairs.....*A. maiae*
2 Inflorescence rufous-scaly; leaflets to 3 pairs.....*A. elaeagnoidea*

Aglaia anamallayana (Bedd.) Kosterm., Reinwardtia 7: 257, f. 10. 1966. *Lansium anamallayanum* Bedd., Madras J. Lit. Sci. ser. 3, 1: 40. 1864 ('*anamalaiense*'); Bedd., Fl. Sylv. t. 131. 1871; Ic. t. 104. 1874; Gamble, Fl. Madras 182(130). 1915.

Tree to 20 m. Leaflets 7, alternate, 7.5-15 × 4.5-5.5 cm, elliptic-

Fig. 76. MELIACEAE. *A. Aglaia lawii*: flowering branch; *Aa*, flower; *Ab*, staminal column. *B. Trichilia connaroides*: flower; *Ba*, staminal column. *C. Munronia pinnata*: flower. *D. Toona ciliata*: stamens and ovary; *Da*, fruit. *E. Dysoxylum binectariferum*: fruit. *F. Aglaia anamallayana*: section of flower.

lanceolate, with domatia at axils of primary nerves beneath. Raceme unbranched. Calyx ciliate. Petals white. Stamens 9-10 in 2 rows, the upper row exserted; staminal column globose, entire. Ovary globose, villous. Berry globular, fleshy, white, scaly. Seeds arillate.

South W. India. Common in semi-evergreen forests in lower Ghats. January. *CJS* 16200, 16671.

Note: Pennington and Styles (*Blumea* 22: 483. 1975) have transferred *Lansium* Rumph. ex Corr. sect. *Neolansium* Harms to the genus *Reinwardtiodendron* Koord. According to this view *A. anamallayana* (Bedd.) Kosterm. should be transferred to *Reinwardtiodendron.* It should be named *R. anamallayanum* (Bedd.) Saldanha.

Aglaia elaeagnoidea (Juss.) Bentham, Fl. Australia 1: 383. 1863; Backer & Bakh. f., Fl. Java 2: 128. 1965. *Nemedra elaeagnoidea* Juss., Mem. Mus. Hist. Nat. Paris 19: 259, t. 14. 1830. *Aglaia roxburghiana* Miq., Ann. Mus. Lugd.-Bat. 4: 41. 1868; Gamble, Fl. Madras 180(128). 1915. *Milnea roxburghiana* (Miq.) Wight & Arn., Prodr. 119. 1834; Wight, Ic. t. 166. 1839.

Tree to 15 m. Leaflets 7, 8-11×2-4 cm, oblong-lanceolate, rounded at base, drying brown beneath. Inflorescence rufous-scaly. Calyx scaly. Petals erect, 1.5×1 mm, oblong. Berry subglobose, ferruginous; seed exarillate.

Indomalaysia. Common in semi-evergreen forests in lower Ghats. January. *CJS* 15994, 16039.

Note: *CJS* 12088 has leaves cuneate at base and drying green.

Aglaia lawii (Wight) Saldanha *comb. nov. Nimmoia lawii* Wight, Calcutta J. Nat. Hist. 7: 13. 1847. *Amoora lawii* (Wight) Bedd., Fl. Sylv. t. 133. 1871; Gamble, Fl. Madras 182 (130). 1915.

Tree to 15 m. Leaflets 5, sometimes alternate, 11-14×4-6 cm, ovate-lanceolate, somewhat oblique. Inflorescence lepidote. Calyx lepidote; petals 4 oblong, to 4×3 mm. Stamens 9, slightly exserted. Ovary lepidote.

South W. India. Occasional in semi-evergreen forests in lower Bisle Ghat. January. *CJS* 16032.

Note: Pennington and Styles (*ibid.* p. 481) have reduced *Nimmoia* Wight (1847) to *Aglaia* Lour.

Aglaia maiae Bourd., J. Bombay Nat. Hist. Soc. 12: 349. 1898; Gamble, Fl. Madras 180(129). 1915.

Tree to 25 m. Leaflets usually 13, 12-16×5.5-6 cm, oblong-elliptic, rounded at tip, oblique, coriaceous. Panicle lax, drying black. Staminal column globose, entire. Ovary hairy; seed exarillate.

South W. India. Common in semi-evergreen forests in lower Bisle Ghat. March-April. *CJS* 13058, 16772.

APHANAMIXIS Blume

Evergreen trees. Flowers polygamous, in spikes or racemes. Sepals usually 5. Petals 3. Staminal tube with 3-6 (-8?) anthers (pistillode small). Ovary 3-locular; stigma subsessile, 3-lobed. Capsule subfleshy; seeds usually 1 per locule, fully or partially enclosed by orange-red or yellow aril.

Aphanamixis polystachya (Wall.) Parker, Indian Forester 57: 486. 1931; Harms in Engl. & Prantl, Pflanzenfam. ed. 2, 19 B 1: 127. 1940; Sant., Fl. Khandala ed. 3, 37. 1967. *Aglaia polystachya* Wall. in Roxb., Fl. Ind. 2: 429. 1824. *Andersonia rohituka* Roxb., Fl. Ind. 2: 213. 1832. *Amoora rohituka* (Roxb.) Wight & Arn., Prod. 119. 1834; Bedd., Fl. Sylv. t. 132. 1871; Gamble, Fl. Madras 181(130). 1915. *Amoora polystachya* (Wall.) J. Hooker & Jackson ex Craib, Fl. Siam Enum. 1: 260. 1926.

Leaflets 7-11, 8-17 × 4-6 cm, oblong-lanceolate, asymmetrical, glabrous. Inflorescence longer than leaves. Stamens 6; ovary villous. Fruit large, coriaceous.

India, Sumatra. Occasional in upper Ghats and common in lower Ghats. April. *CJS* 13279, *HFP* 1130.

AZADIRACHTA A. Jussieu

Leaves often even-pinnate by reduction of terminal leaflet; leaflets 12-16, crenate-serrate, oblique. Flowers 5-merous. Staminal column 10-fid at tip; anthers exserted. Ovary 3-locular; style elongate; stigma 3-lobed, with a light colored rim at base. Drupe pulpy, cylindric, 1-locular, 1-seeded; seed exarillate.

Azadirachta indica A. Juss., Mem. Mus. Hist. Nat. Paris 19: 221, t. 2, f. 5. 1830; Wight, Ic. t. 17. 1838; Gamble, Fl. Madras 177(127). 1915. *Melia azadirachta* L., Sp. Pl. 385. 1753; Bedd., Fl. Sylv. t. 14. 1869.

Evergreen trees to 15 m. Leaflets 4-6 × 1-1.5 cm, ovate-lanceolate, acuminate, cuneate and unilaterally resected on one side, cuneate-serrate. Flowers elongate. Sepals 5, free; petals obovate, white. Anthers slightly exserted. Ovary globose; style elongate, cylindrical; stigma 3-lobed.

Widely cultivated. Common in plains and upper Ghats, usually cultivated. January-July. *CJS* 13924, 16619.

CIPADESSA Blume

Shrubs. Leaflets coarsely serrate toward apex. Flowers 5-merous. Staminal filaments fused below, forked above with the sessile anthers

between forks. Disc patelliform, adnate to the short staminal column. Ovary usually 5-locular; style elongate; stigma globose, 5-toothed. Berry 5-seeded, grooved vertically.

Cipadessa baccifera (Roth) Miq., Ann. Mus. Lugd.-Bat. 4: 6. 1868-69; Gamble, Fl. Madras 176(126). 1915. *Melia baccifera* Roth, Nov. Pl. Sp. 215. 1821.

Leaflets 4-10×2-5 cm, subovate, usually hairy on nerves beneath. Inflorescence hairy. Sepals sparsely ciliate. Petals pubescent.

Indomalaysia. Common in Ghats, in open countryside and semi-evergreen forests. April-July. *CJS* 9071, 9974, 13589.

DYSOXYLUM Blume

Inflorescence axillary, often on old wood, of panicles, sometimes with short lateral branches. Flowers 4-5-merous. Petals free or adnate to staminal column. Anthers inserted near tip. Disc cupular or tubular, as long as ovary, sometimes longer. Ovary 2-5-locular; style elongate, as long as the staminal tube; stigma peltate. Capsule woody-coriaceous; seeds with or without aril.

Dysoxylum binectariferum (Roxb.) J. Hooker ex Bedd., Trans. Linn. Soc. London 25: 212. 1866; Gamble, Fl. Madras 178(127). 1915. *Guarea binectarifera* Roxb., Fl. Ind. 2: 240. 1832 ('*binertarifera*'). *Dysoxylum macrocarpum* Bedd., Fl. Sylv. t. 150. 1871.

Trees to 20 m. Leaflets alternate, 10-14×3.5-5 cm, elliptic-lanceolate, oblique, coriaceous. Calyx cup-shaped, half as long as petals; petals 4, spreading, mucronate at tip; disc tubular. Capsule large, woody, 5 cm in diam., 2-4-seeded; seeds exarillate.

South W. India, Sri Lanka. Common in semi-evergreen forests of Bisle Ghat and in the shola forests at Malgod in the foothills of Genkalbetta. Our specimens are fruiting (July and December). *CJS* 14183, 15505.

MELIA Linnaeus

Leaves 2-3-pinnate; leaflets crenate, sometimes pinnatifid. Flowers 5-6-merous. Staminal filaments fused into 10-12-fid tube; anthers sessile. Disc cupular, fleshy, surrounding ovary. Ovary glabrous, 4-8-locular; style elongate; stigma capitate. Drupe ellipsoid, glabrous, pulpy, usually 5-locular.

Melia dubia Cav., Diss. 7: 364. 1789; Backer & Bakh. f., Fl. Java 2:

120. 1965. *Melia composita* Willd., Sp. Pl. 2: 509. 1799; Bedd., Fl. Sylv. t. 12. 1869; Gamble, Fl. Madras 176(126). 1915.

Deciduous trees to 8 m. Leaflets 4-6×2-3 cm, ovate-lanceolate, crenate. Sepals pilose. Petals erect, linear-oblong, rounded. Anthers exceeding segments of staminal column.

India to Australia, Angola in Africa. Common in open country in the eastern plains. March. *CJS* 10599.

Note: The taxa of this genus (species, varieties, etc.) apparently intergrade.

MUNRONIA Wight

Deciduous shrublets. Inflorescence axillary, 1-few-flowered. Flowers large, 5-merous. Petals 5, united at least half way with each other and the staminal column. Staminal column 10-fid at tip; anthers pubescent. Disc tubular, sheathing ovary and style base. Ovary 5-locular; ovules 2 in each; style elongate; stigma capitate-lobed. Capsule 5-lobed; valves separating from the 5-winged axis.

Munronia pinnata (Wall.) Harms, Ber. Deutsch. Bot. Gesellsch. 35: 78. 1917; A. S. Rao, Bull. Bot. Surv. India 5: 255. 1964. *Turraea pinnata* Wall., Pl. As. Rar. 2: 21, t. 119. 1829. *Munronia wallichii* Wight, Ill. 1: 147, t. 54. 1840; Gamble, Fl. Madras 175(125). 1915.

Shrublets to 1 m. Leaflets ovate-elliptic, acuminate, 6-12×3-4.5 cm, hairy on nerves below. Sepals obovate or elliptic, hairy, green; petals white, elongate, spatulate, to 4×1 cm, pubescent.

South W. India, Sikkim. Common in forest undergrowth in Ghats. March-August. *HFP* 560, 1761.

TOONA (Endlicher) Roemer

Note: Sometimes regarded as congeneric with New World genus *Cedrela* P. Browne. This genus (with free stamens) is sometimes put in *Flindersiaceae* with *Cedrela* and *Chloroxylon.*

Deciduous trees. Leaves usually even-pinnate. Flowers 4-5-merous. Petals attached to disc below. Receptacle produced into a fleshy crenulate disc. Stamens 5, free, inserted on disc. Ovary 5-locular; locules 8-10-ovuled; style elongate; stigma globose. Capsule woody, 5-valved, with a thick central, 5-angled column; seeds winged.

Toona ciliata Roemer, Syn. Hesper. 139. 1846; Sant., Fl. Khandala ed. 3, 38. 1967. *Cedrela toona* Roxb. ex Rottler, Ges. Naturf. Freunde Berlin Neue Schriften 2: 198. 1803; Wight, Ic. t. 161. 1839; Bedd., Fl. Sylv. t. 10. 1869; Gamble, Fl. Madras 186(133). 1915.

Trees to 25 m. Leaflets 10-16×2.5-5.5 cm, ovate-oblong. Petals keeled at point of insertion with disc. Ovary and disc pubescent.

India to Australia. Common in upper Ghats. December-February. A roadside tree. *CJS* 12057, 15830, 16259.

TRICHILIA P. Browne

Flowers 4-5-merous. Staminal filaments united for about half their length, forking at tip with anthers between forks. Disc fleshy, cupular, surrounding ovary. Ovary more or less immersed in disc, 2-3-locular; style elongate; stigma peltate. Capsule usually 2-valved, usually 1-seeded; seed covered by white aril.

Trichilia connaroides (Wight & Arn.) Bentvelzen, Acta Bot. Neerl. 11: 13. 1962. *Heynea trijuga* Roxb. ex Sims, Bot. Mag. 41: t. 1738. 1815 [not *Trichilia trijuga* Vell., 1825]; Gamble, Fl. Madras 183(131). 1915. *Heynea affinis* A. Juss., Mem. Mus. Hist. Nat. Paris 19: 235, 275. 1830 [not *Trichilia affinis* A. Juss., 1829]; Bedd., Fl. Sylv. t. 134. 1871. *Zanthoxylum connaroides* Wight & Arn., Prodr. 148. 1834 ('*Zanthoxylon*').

Tree to 20 m. Leaves 7-foliolate; leaflets 8-14×3.5-6 cm, ovate, somewhat oblique, pale beneath. Panicle sometimes longer than leaf. Sepals ciliate. Petals white. Staminal filaments with 2 short linear tooth-like appendages. Ovary 2-locular. Capsule globose.

South W. India. Common in Ghats, along outskirts of wet deciduous to semi-evergreen forests. January-August. The red capsules are conspicuous. *CJS* 13584, *HFP* 1447.

WALSURA Roxburgh

Flowers 4-5-merous. Staminal filaments shortly fused below or free, forked above with anthers in the notch. Disc usually annular, fleshy. Ovary immersed in disc, 2-locular or falsely 4-locular; style dilated above; stigma peltate. Berry leathery, 1-4-locular, enclosing as many arillate seeds.

Walsura trifolia (A. Juss.) Harms in Engl. & Prantl, Pflanzenfam. ed. 2, 19b: 119, 177. 1940. *Heynea trifolia* A. Juss., Mem. Mus. Hist. Nat. Paris 19: 235. 1830. *Walsura piscidia* Roxb., Fl. Ind. 2: 387. 1832; Wight, Ill. 1: t. 55. 1840; Gamble, Fl. Madras 183(131). 1915.

Small trees. Leaves 3-5-foliolate. Sepals ciliate. Petals imbricate, minutely ciliate. Staminal filaments fused about half their length. Fruit elliptic, to 1.8×1.5 cm, tomentose.

South W. India. Occasional in semi-evergreen forests in Ghats. November-April. *CJS* 13281, 15525.

97. ZYGOPHYLLACEAE

K. N. Gandhi

TRIBULUS Linnaeus

Prostrate herbs. Leaves opposite and unequal or alternate with one leaf aborted, paripinnate; stipules interpetiolar, lanceolate, persistent; leaflets opposite, entire; venation pinnate. Flowers solitary, bracteolate, bisexual, regular, 5-merous. Sepals free, imbricate, deciduous. Petals free, imbricate, fugacious. Stamens 5-10, free, subequal or unequal, alternate ones subtended by erect glands; filaments naked; anthers medifixed. Disc extra or intrastaminal. Ovary superior, sessile, 5-12-locular; locule with 3-more axillary ovules; style short; stigmas 5-12. Fruit a 5-angled or 5-12-winged schizocarp with spinous-tuberculate cocci with 3-5-superposed seeds separated by horizontal septa.

Tribulus terrestris L., Sp. Pl. 387. 1753; Gamble, Fl. Madras 130(92). 1915. *Tribulus lanuginosus* L., Sp. Pl. 387. 1753; Wight, Ic. t. 98. 1838.

Silky herbs. Leaves 2-4 cm long; leaflets 6-10, oblong, to 1 × 0.5 cm. Flowers 1 cm across, yellow; peduncle 1-1.5 cm long. Stamens 10. Disc of 10 erect scales in 2 rows on inner and outer sides of stamens opposite the sepals. Ovary hirsute, 5-locular. Cocci of fruit 5, woody, each with 2 large and a few small spines.

Tropics. Frequent in dry, sandy places across plain. July-November. *CJS* 10804, *HFP* 2222.

98. OXALIDACEAE

T. P. Ramamoorthy

Leaves alternate, usually estipulate, pinnately or palmately compound; leaflets opposite, entire, pinnately veined. Flowers bisexual, regular, 5-merous, bracteolate. Sepals free, usually imbricate, persistent. Petals usually imbricate, contorted, free. Disc none. Stamens 10, biseriate, connate below; anthers versatile. Ovary superior, 5-locular; ovules usually many, axile; styles usually 5; stigmas globose, entire. Fruit usually a dry loculicidal 5-valved capsule. Seeds few-many, with arilliform integument.

1 Leaves pinnately many-foliolate ..... **Biophytum**
1 Leaves palmately 3-foliolate ..... **Oxalis**

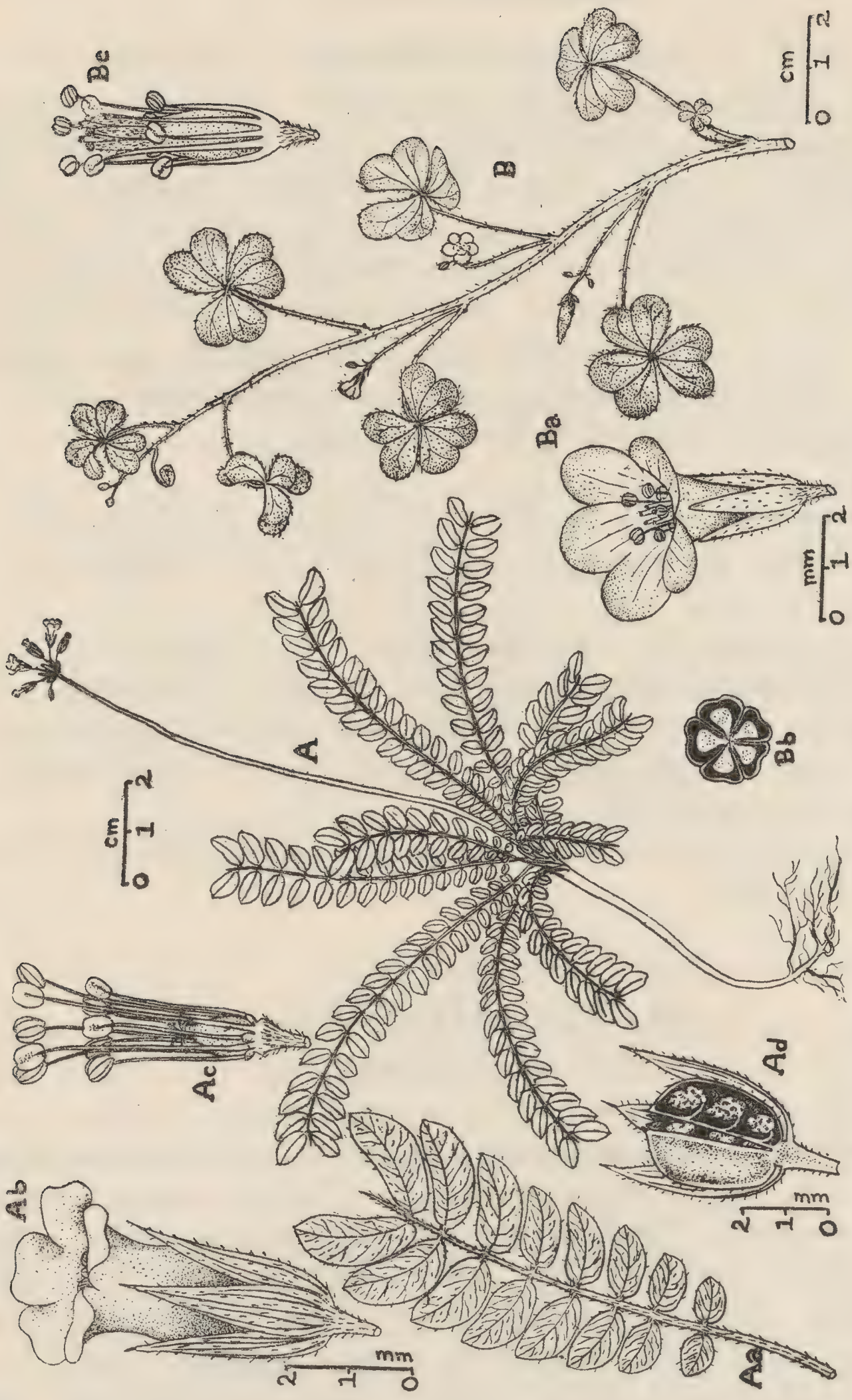


Fig. 77. OXALIDACEAE. *A. Biophytum sensitivum* var. *candolleanum*: habit; *Aa*, leaf; *Ab*, flower; *Ac*, stamens and ovary; *Ad*, fruit. *B. Oxalis corniculata*: flowering twig; *Ba*, flower; *Bb*, section of ovary; *Be*, stamens and ovary.

BIOPHYTUM de Candolle

Perennial herbs. Leaves crowded, even pinnate; leaflets rectangular, slightly oblique, pinnately veined. Inflorescence usually subterminal. Capsule few-seeded.

Biophytum sensitivum (L.) DC., Prodr. 1: 690. 1824. *Oxalis sensitiva* L., Sp. Pl. 434. 1753.

var. **candolleanum** (Wight) Edgew. & J. Hooker, Fl. Brit. India 1: 437. 1874; Kunth in Engl., Pflanzenr. 95: 394. 1930. *Biophytum candolleanum* Wight, Ill. 1: 161, t. 62. 1840 ('*candolianum*'); Gamble, Fl. Madras 133(95). 1915.

Suffrutescent herbs to 20 cm with unbranched stems. Leaflets many, pilose or strigose above, the upper ones larger, to 0.8×0.4 cm, glaucous beneath; the main rachis hairy. Peduncle elongate. Inflorescence umbelliform.

Western Peninsular India, Sri Lanka. Common in upper Ghats, in shade, along roadsides, at bases of rocks in open country. May-October. *CJS* 11735, 13634, *HFP* 458.

OXALIS Linnaeus

Usually herbs. Leaves palmately 3-foliolate. Inflorescence 1-10-flowered pseudoumbels. Stamens in 2 unequal rows. Capsule many-seeded.

Oxalis corniculata L., Sp. Pl. 435. 1753; Gamble, Fl. Madras 132(94). 1915.

Trailing herbs, rooting at nodes. Leaves palmately trifoliolate; leaflets obovate, emarginate, sparsely hairy, acidic to taste. Inflorescence axillary, of simple umbels.

Pantropics. Common weed. All seasons. *CJS* 10243, 14071.

* * *

Averrhoa bilimbi L. and *A. carambola* L. are cultivated for their acidic fruits.

99. BALSAMINACEAE

T. P. Ramamoorthy

IMPATIENS Linnaeus

Herbs, rarely shrubby. Leaves alternate, opposite or whorled, estipulate; petiole sometimes glanduliferous, blade serrate-dentate, pinnately

or palmately veined. Inflorescence of fascicles, racemes, sometimes panicles, rarely of solitary flowers. Flowers often showy, bisexual, irregular. Sepals 3, imbricate; 2 small and sepaloid; the posterior lip larger, petaloid, usually spurred. Petals 3, free, the anterior standard smaller, the lateral wings 2 (each of 2 elements). Disc none. Stamens 5; anthers coherent in a body covering stigmas, dehiscing by longitudinal slits or by terminal pores. Ovary superior, 5-locular; ovules many per locule, axile; stigma 5-lobed. Fruit a 5-valved, loculicidally, explosively dehiscent capsule. Seeds few-many, smooth or tubercled.

1 Plant acaulescent.
 2 Lip spurless; flower white.....*I. stocksii*
 2 Lip spurred; flower pink or mauve.
  3 Spur linear, not inflated; 1½ times longer than wings.....*I. scapiflora*
  3 Spur flat, inflated toward tip, as long as or slightly shorter than wings.....*I. barberi*
1 Plant caulescent.
 4 Leaves all alternate.
  5 Leaves broad, crenate; calyx glabrous; seeds hirtellous.....*I. trichocarpa*
  5 Leaves narrow, serrate; calyx hairy; seeds smooth.....*I. balsamina*
 4 Leaves opposite and/or whorled.
  6 Lip with a very short spur (1/3 the size of lip or less) or not spurred.
   7 Spur none.....*I. herbicola*
   7 Spur very short.
    8 Leaves rounded at apex; flower of medium size.....*I. oppositifolia*
    8 Leaves acute at apex; flower very small.....*I. inconspicua*
  6 Lip long-spurred.
   9 Sepals ovate; leaves alternate, opposite and whorled.....*I. gardneriana*
   9 Sepals linear; leaves opposite.
    10 Leaves petioled.....*I. kleinii*
    10 Leaves sessile.
     11 Stem flaccid, branching.....*I. diversifolia*
     11 Stem stiff, hardly branching.....*I. chinensis*

Impatiens balsamina L., Sp. Pl. 938. 1753; Gamble, Fl. Madras 142(101). 1915.

Annuals. Leaves 4-12×1.2-1.5 cm, elliptic, acute at both ends, penninerved; petiole usually glandular. Flowers pink, in fascicles of 1-3, axillary. Lateral sepals ovate; lip saccate, with a 1.8-3.5 cm spur, glabrous or hairy. Standard broad, rounded, aristate; wing unequally 2-lobed, with a small basal lobe. Capsule tomentose; seeds smooth.

Indomalaysia, China. Common in plains and Ghats, in moist soil on bunds of paddy fields, in well-drained areas, sometimes at mountain tops. August-October. *CJS* 15041, *HFP* 2133.

Impatiens barberi J. Hooker, Rec. Bot. Surv. India 4: 45. 1906; Gamble, Fl. Madras 139(99). 1915.

Acaulescent, tuberous herbs. Leaves orbicular, 1.5 cm. Flower

Photo: C. Saldanha

Plate 1. GNETUM ULA Brongn. (Gnetaceae). Maturing ovules of frequent Gymnosperm in the Ghats (p. 32).

Photo: C. Saldanha

Plate 2. GORDONIA OBTUSA Wall. ex Wt. & Arn. (Theaceae).
Flower from tree in upper Ghats (p. 121).

Photo: C. Saldanha

Plate 3. ARDISIA SOLANACEA Roxb. (Myrsinaceae).
Flowers of shrub in upper Ghats (p. 202).

Photo: C. Saldanha

Plate 4. WAGATEA SPICATA Dalz. (Fabaceae-Caesalpinioideae).
Large armed climber in lower Ghats (p. 225).

Photo: C. Saldanha

Plate 5. BUTEA MONOSPERMA (Lam.) Taub. (Fabaceae-Faboideae).
Deciduous tree in dry plain (p. 238).

Photo: C. Saldanha

Plate 6. OSBECKIA HISPIDISSIMA Wt. (Melastomataceae).
Flower from shrub in upper Ghats (p. 289).

Photo: C. Saldanha

Plate 7. CHRISTISONIA BICOLOR Gard. (Orobanchaceae).
Flowers of total root parasite in upper Ghats (p. 532).

Photo: C. Saldanha

Plate 8. CHRISTISONIA TUBULOSA (Wt.) Bent. ex Hk. (Orobanchaceae).
Total root parasite in upper Ghats (p. 534).

Photo: C. Saldanha

Plate 9. THUNBERGIA MYSORENSIS (Wt.) Anders. (Acanthaceae).
Flower of slender twiner in Ghat forests (p. 561).

Photo: C. Saldanha

Plate 10. ARISAEMA LESCHENAULTII Bl. (Araceae).
Pistillate spadix with pistillate flowers, acicular
sterile flowers and naked appendix (p. 784).

Photo: C. Saldanha

Plate 11. CRYPTOCORYNE RETROSPIRALIS (Roxb.) Kunth (Araceae).
Spadix with few, whorled pistillate flowers, naked central constriction,
terminal staminate portion in separate chamber of spathe (p. 786).

Photo: C. Saldanha

Plate 12. LAGENANDRA OVATA (L.) Thw. (Araceae). Spathe with many spiralled pistillate flowers, naked central constriction, and terminal staminate portion all in one chamber of spathe (p. 787).

Photo: C. Saldanha

Plate 13. REMUSATIA VIVIPARA (Roxb.) Schott (Araceae). Greenish pistillate flowers, central sterile constriction and upper fertile synandria (p. 788).

Photo: C. Saldanha

Plate 14. DENDROBIUM AQUEUM Lindl. (Orchidaceae). Flower of an epiphyte in the upper Ghats (p. 819).

Photo: C. Saldanha

Plate 15. GASTROCHILUS FLABELLIFORMIS (Blatter & McCann) Saldanha (Orchidaceae). Flowers with saccate, keeled spurs (p. 830).

Photo: C. Saldanha

Plate 16. GASTROCHILUS PULCHELLUS (Wt.) Schlechter (Orchidaceae).
Flowers with only saccate spurs (p. 830).

Photo: C. Saldanha

Plate 17. OBERONIA SANTAPAUI Kapadia (Orchidaceae).
Flowering spike (p. 839).

Photo: C. Saldanha

Plate 18. PORPAX RETICULATA Lindley (Orchidaceae). Flower with fused, tubular sepals (p. 845).

Photo: C. Saldanha

Plate 19. LYCOPODIUM MACROSTACHYS Spring (Lycopodiaceae).
An epiphyte in the upper Ghats.

Fig. 78. BALSAMINACEAE. *A. Impatiens barberi*: plant in flower; *Aa*, flower, front view; *Ab*, same, back view; *Ac*, floral parts dissected; *Ad*, stamens covering ovary. *B. Impatiens stocksii*: flower. *C. Impatiens gardneriana*: flower, front view; *Ca*, ovary, cross section. *D. Impatiens balsamina*: calyx. *E. Impatiens diversifolia*: calyx. *F. Impatiens herbicola*: calyx. *G. Impatiens inconspicua*: calyx; *Ga*, fruit.

1-3, on an elongate scape, mauve. Lateral sepals ovate; lip carinate with a flat, elongate, incurving spur inflated toward tip. Standard rounded, notched; wing-3-lobed with a long filamentous, dorsal auricle produced into the spur, papillose on the dorsal side at base.

Lower Ghats of Hassan District. Common, on wet dripping rocks and tree trunks in semi-evergreen forests. August-September. *HFP* 1998, 2042.

Impatiens chinensis L., Sp. Pl. 738. 1753; Gamble, Fl. Madras 139(99). 1915. *Impatiens fasciculata* Lam., Encycl. 1: 359. 1783; Wight, Ic. t. 748. 1844.

Annuals. Leaves 3-7 × 0.7-1.5 cm, obovate-linear, sometimes rounded, glabrous or scabrid above, glaucous beneath; stipules subulate, recurved. Flower usually solitary, white to pink. Sepals linear-lanceolate; lip carinate, saccate, with a long, incurving spur. Standard ovate; wing broadly obovate, with a small basal lobe. Capsule glabrous.

China, India. Common in upper Ghats, in open marshy ground or grasslands. August-October. A very variable plant. *CJS* 10046, 14725.

Impatiens diversifolia Wall. ex Wight & Arn., Prodr. 139. 1834; Gamble, Fl. Madras 140(99). 1915.

Annuals. Leaves opposite, 1-3.5 × 0.4-1.5 cm, oblong-obovate, sometimes rounded, usually glaucous beneath. Flower solitary, pink to white. Sepals subulate; lip saccate with an incurving spur. Standard orbicular, mucronate; wing 2-lobed; basal lobe small, acute, the distal entire, obovate.

South W. India. Vanagur, in upper Bisle Ghat. In open country, along roadsides, road cuts. September-October. *HFP* 2132, 2164.

Note: Our identification is tentative. Our plants approach *Impatiens chinensis* and *Impatiens diversifolia.* However, they have flaccid habit and lobed wings.

Impatiens gardneriana Wight, Ic. t. 1050. 1846; Gamble, Fl. Madras 141(101). 1915.

Slender succulent annuals. Leaves opposite and whorled, 7-14 × 2-5 cm, ovate-lanceolate, pinnately veined, sparsely hairy. Flowers purple. Sepals ovate, hairy; lip saccate, carinate, with a 2.5 cm slender spur. Standard obovate, mucronate, basal half keeled beneath; wing of 2 unequal lobes; lower slightly emarginate, upper obscurely 3-lobed. Capsule glabrous.

South W. India. Common in shade, on humus collected on rocks, or along streams or roads. August-September. *HFP* 1966, 1997.

Impatiens herbicola J. Hooker, Bull. Misc. Inform. 354. 1911; Gamble, Fl. Madras 141(100). 1915.

Slender annuals. Leaves to 3.5×0.4 cm, linear-lanceolate, acute, glabrous. Flowers 3 mm, pinkish-white, in pairs, sometimes single. Sepals subulate; lip cymbiform, saccate, acute. Standard broadly ovate; wing stalked, rounded, with a small obovate basal lobe, glabrous.

South W. India in the Anamalais and Travancore hills. Collected once in shade amongst small bushes on mountain peaks at Vanagur in upper Bisle Ghat. September. *HFP* 2131.

Impatiens inconspicua Benth. ex Wight & Arn., Prodr. 139. 1834; Wight, Ic. t. 970. 1845. *Impatiens filiformis* Wight & Arn., Prod. 140. 1834. *Impatiens pusilla* Heyne ex J. Hooker & Thoms., J. Linn. Soc., Bot. 4: 122. 1859; Gamble, Fl. Madras 140(100). 1915. *Impatiens rosmarinifolia* auct. non Retz.: Wight, Ic. t. 750. 1844.

Slender annuals. Leaves opposite, 2-5×0.5-1.5 cm, ovate-lanceolate, pinnately veined, glabrous, glaucous beneath. Flowers pink, usually 2-3-fascicled. Sepals subulate; lip saccate, spurred or sometimes spur obscure. Standard ovate, mucronate; wing obovate, entire, with ovate, acuminate basal lobe.

South W. India. Locally common at Vanagur, among grasses and rock crevices at mountain top. September. *CJS* 17812, *HFP* 738, 2134.

Impatiens kleinii Wight & Arn., Prodr. 140. 1834; Wight, Ic. t. 884. 1844-45; Gamble, Fl. Madras 141(100). 1915.

Slender annuals. Petiole glandular; blade 2.8×0.7-2 cm, ovate-oblong, sometimes linear, entire, hairy on nerves. Flower usually solitary, pink, purple or white. Sepals subulate; lip carinate, saccate, with an elongate straight spur. Standard ovate, dorsally winged; wing stipitate, entire, obovate, rounded. Capsule glabrous.

South W. India. Common in Ghats. July-October. *HFP* 1878, 1993.

Impatiens oppositifolia L., Sp. Pl. 937. 1753; Wight, Ic. t. 883. 1844-45; Gamble, Fl. Madras 141(100). 1915. *Impatiens rosmarinifolia* Retz., Obs. Bot. 5: 29. 1788.

Slender annuals. Leaves opposite, 0.8-1.5×0.4-0.6 cm, linear-oblong, rounded, sparsely hairy. Flowers saffron-coloured, solitary. Sepals linear; lip saccate, spur short, incurving. Standard orbicular, mucronate, carinate; wing acute, stipitate, with short basal lobe.

South W. India, Sri Lanka. Occasional in upper Ghats in open grasslands. August. *HFP* 1968.

Impatiens scapiflora Heyne ex Roxb., Fl. Ind. 2: 464. 1824; Gamble, Fl. Madras 138(98). 1915. *Impatiens rivalis* Wight, Ic. t. 751. 1844.

Acaulescent herbs. Leaves palmately veined, usually orbicular-ovate,

rounded-acute, 12×10 cm, often reddish. Flowers pink, racemed; scape elongate to 14 cm. Sepals ovate; spur saccate with a long spur. Standard rounded. Wing 3-lobed.

South W. India. Common in wet deciduous to semi-evergreen forests of Ghats on vertical surfaces of dripping rocks. July-September. *HFP* 486, 739, 1992.

Impatiens stocksii J. Hooker & Thomson, J. Linn. Soc., Bot. 4: 119. 1859; Gamble, Fl. Madras 1870(1294). 1936.

Acaulescent herbs. Leaves to 3.2×2.8 cm, ovate-orbicular, obtuse, rounded at base, palmately veined, glabrous. Flowers white, few-many, racemed; scape to 10 cm long. Sepals ovate; lip ovate, nearly flat, spurless. Standard orbicular; wing 3-lobed, with lowest the longest, papillose near base.

Mountains of Coorg, now at Bisle Ghat. In wet deciduous to semi-evergreen forests. On wet tree trunks. August-September. *CJS* 17815, *HFP* 432, 2003.

Note: Gamble (*l. c.*) p. 1870 [1293] states that the wing petal is of 2 filamentous lobes. Six collections, collected at different times and different places, have been studied. They consistently show 3 lobes (oblong, not filamentous). This agrees with Hooker's observation (*Fl. Brit. India* 1: 442. 1874).

Impatiens trichocarpa J. Hooker, Hooker's Icon. Pl. t. 2914, 1910; Gamble, Fl. Madras 142(101). 1915.

Annuals. Leaves alternate, 4.5-7×2.5-3.5 cm, ovate-elliptic, acute at both ends, sparsely hairy; petiole slender, often glandular near tip. Flowers 1-4 together, pink. Sepals ovate; lip carinate with spur elongate, linear, white. Standard orbicular, emarginate, with dorsal mucro; wing 2-lobed; lobes oblong, truncate at both ends. Capsule tomentose.

Nilgiris in South W. India, now in upper Ghats of Hassan. Occasional, along roadsides in Vanagur and Genkalbetta. August-October. *CJS* 15253, *HFP* 524.

100. ERYTHROXYLACEAE

T. P. Ramamoorthy

ERYTHROXYLUM Linnaeus

Shrubs or small trees. Leaves alternate; stipules inter-petiolar, rarely bifid, sometimes emarginate, persisting or deciduous; blade simple, entire, pinnately veined. Inflorescence of axillary fascicles, sometimes of solitary flowers. Flowers bisexual, regular, pedicelled, with a pair of bracteoles at base. Sepals 5, shortly fused, persistent; lobes imbricate. Petals 5 with an emarginate, erect ligule attached to the tip of claw. Stamens

Fig. 79. ERYTHROXYLACEAE. *Erythroxylum monogynum*: *A*. Flowering and fruiting twig; *B*. flower; *C*. same, without corolla; *D*. pistil; *E*. petal; *F*. section of ovary; *G*. fruit.

10, monadelphous. Ovary superior, 3-locular (usually 1 locule only fertile); ovules 1-2 in each, pendulous; styles as many as locules, basally connate; stigmas capitate. Fruit 1-celled, 1-seeded drupe.

Erythroxylum monogynum Roxb., Pl. Cor. t. 88. 1798; Gamble, Fl. Madras 127(90). 1915. *Sethia indica* DC., Prodr. 1: 576. 1824, *nom. superfl.* *Erythroxylum indicum* (DC.) Bedd., Fl. Sylv. t. 81. 1871.

Shrubs. Leaves alternate, sometimes fascicled on short shoots, 2-5 × 0.5-1.8 cm, obovate, rounded-emarginate, drying glaucous-brown below; stipules emarginate. Flowers solitary or fascicled; pedicel thickened near tip. Petals white. Drupe 0.8-0.9 × 0.4 cm, cylindric, smooth, tipped by persistent styles.

South W. India. Common in open dry hilly tracts and scrub jungles in the plain. May-December. *CJS* 13839, *HFP* 146.

101. LINACEAE

K. N. Gandhi

Herbs or shrubs, rarely trees. Leaves alternate, occasionally opposite or whorled; stipules present or absent; leaf blade simple, usually entire; venation pinnate or palmate. Inflorescence racemose, cymose or of solitary flowers; bracts sometimes present. Flowers bisexual, regular. Sepals usually 5, free or slightly connate at base, imbricate. Petals generally 5, free, contorted or imbricate, often clawed, fugacious. Stamens 1-3 times the number of petals, often alternating with staminodes; filaments connate at base, equal or unequal; anthers 2-celled. Disc glanduliform, adnate to staminal column or absent. Ovary superior, 3-5-locular, with 2 pendulous ovules in each locule or spuriously 6-10-locular, with 1 pendulous ovule in each; styles 3-5, almost free; stigmas capitate. Fruit usually a septicidal capsule, surrounded by persistent calyx, few-many-seeded.

1 Small herbs. Leaves faintly 3-nerved. Styles 5 ..... **Linum**
1 Undershrubs. Leaves penninerved. Styles 3 ..... **Reinwardtia**

LINUM Linnaeus

Slender herbs, rarely suffrutescent. Leaves alternate, 1-many-palminerved; stipules glanduliform or 0. Flowers small, pedicelled. Sepals free. Petals contorted, exceeding sepals. Stamens 5, alternate with minute staminodes; filaments dilated and connate below; anthers oblong, medifixed. Disc of glands or 0. Ovary 5-locular, each 2-locellate by a false partition; styles 5. Capsule globose, 10-valved.

Linum mysorense Heyne ex Bentham, Edward's Bot. Reg. 16: t. 1326. 1830; Gamble, Fl. Madras 125(89). 1915.

Erect, slender herbs, usually branched in upper part and appearing corymbose. Leaves sessile, linear, acute, to 12×2 mm, faintly 3-nerved. Flowers basically solitary. Sepals oblong or narrowly ovate, subacute, 2.5 mm long. Petals obovate, obtuse, 4-6 mm long, yellow. Capsule 2 mm across, glabrous; seeds 10, compressed, ovoid.

South India, Sri Lanka. Occasional small herbs in forest clearings, in upper Ghats and on bunds of paddy fields in western plain. September-December. *CJS* 9279, 9973.

REINWARDTIA Dumortier

Leaves alternate, petiolate, entire or crenate-serrate, membranous; venation pinnate; stipules minute and caducous or 0. Inflorescence an axillary, short raceme, terminal corymb or of solitary flowers. Pedicels bracteate. Sepals free or slightly connate at base. Petals contorted, larger. Stamens 5, alternating with 5 staminodes; filaments equal or unequal, connate at base; anthers oblong, medifixed. Disc of 3-4 glands. Ovary 3-4-locular, each locule 2-locellate by false partition; styles 3-4. Capsule globose, 6-8-valved.

Reinwardtia indica Dumortier, Comm. Bot. 19. 1822; Backer & Bakh. f., Fl. Java 1: 241. 1963. *Linum trigynum* Roxb., Asiat. Res. 6: 357. 1799, non L., 1753. *Reinwardtia trigyna* Planchon, London J. Bot. 7: 522. 1848; Gamble, Fl. Madras 126(90). 1915, *nom. superfl.*

Glabrous, small shrubs. Petiole 1-3 cm long; leaf blade entire, elliptic-oblong, subacute at apex, shortly narrowed at base, to 9×3.5 cm. Flowers solitary; pedicels 2-4 cm long, slender. Sepals narrowly ovate, acuminate at apex, 0.9×0.4 cm. Petals oblong, 3 cm long, yellow. Stamens of various lengths. Styles 3, equaling or shorter than stamens. Capsule 4-6 cm across, glabrous; seeds reniform.

Indomalaysia. Locally common in a cardamum plantation at Harihalli (western plain) and occasional in upper Ghats in undergrowth. September-November. *CJS* 9040A, 9304, *HFP* 1313.

Note: In 1822 when Dumortier named this taxon, he could have adopted the epithet *trigyna* which under Art. 72 would have become a legitimate epithet in *Reinwardtia* although its basionym, *Linum trigynum* Roxb. (1799), was a later homonym and illegitimate. However he adopted a new epithet, *indica*, which he was free to do, no epithet at that time being legitimately published. Planchon's (1848) binomial *Reinwardtia trigyna*, based on *Linum trigynum*, is legitimate under Art. 72 but illegitimate under Art. 63 (a superfluous name) being a second naming of a taxon with a legitimate name (*R. indica*).

102. MALPIGHIACEAE

K. N. Gandhi

Woody, often climbing, with pubescence of medifixed hairs. Leaves usually opposite; stipules present or not; blade simple, usually entire, often glandular beneath around the base; venation pinnate or subpalmate. Peduncle bracteate; pedicels articulated, 2-bracteolate. Flowers bisexual, occasionally polygamous. Calyx 5-partite, persistent, imbricate. Petals 5, free, imbricate, generally clawed. Disc inconspicuous. Stamens usually 10, equal or 1 larger; filaments often connate at base; anthers short. Ovary superior, 3-locular; locules with solitary, axile ovule; styles usually 3; stigma inconspicuous. Fruit often a schizocarp of 1-3-winged mericarps.

1 Leaves cordate with subpalmate venation. Calyx eglandular.....**Aspidopterys**
1 Leaves acute with pinnate venation. Calyx with a prominent gland outside, partly adnate to the pedicel.....**Hiptage**

ASPIDOPTERYS A. Jussieu

Woody twiners. Leaves eglandular, with subpalmate venation. Inflorescence usually a panicle. Calyx eglandular. Petals not clawed, entire, glabrous. Stamens equal, glabrous; filaments filiform. Ovary 3-lobed; styles 3. Fruit of 3 samaras; the wings ovate-orbicular.

Aspidopterys cordata (Wall.) A. Juss., Ann. Sci. Nat. Bot. ser. 2, 13: 267. 1840; Gamble, Fl. Madras 129(92). 1915. *Hiraea cordata* Heyne ex Wall., Pl. As. Rar. 1: 13. 1829.

Petiole 3.5-4 cm long; blade suborbicular, acuminate, cordate, white-tomentose beneath, to 10×8 cm, chartaceous. Petals greenish-white. Staminal filaments dilated at base, shortly connate. Ovary villous. Samaras 3-4 cm across.

South W. India. Locally common at Byra (dry deciduous). September-December. *CJS* 15133, *HFP* 1002.

HIPTAGE Gaertner

Climbing shrubs. Leaves with 2 glands beneath toward the base; venation pinnate. Inflorescence a raceme or panicle. Flowers bisexual, irregular. Calyx provided with a conspicuous gland without. Petals clawed, unequal. Stamens unequal; one 2-3 times larger than the rest; filaments connate at base, declinate. Ovary villous, 3-lobed; 1 style perfect, circinate in bud; rudimentary styles 2. Fruit of 1-3 samaras, each with a longer, median wing and 2 shorter lateral wings.

Fig. 80. MALPIGHIACEAE. *A.* *Hiptage benghalensis*: flowering twig; *Aa*, flower; *Ab*, same, without petals; *Ac*, fruit. *B.* *Aspidopterys cordata*: flower; *Ba*, section of flower; *Bb*, section of ovary.

Hiptage benghalensis (L.) Kurz, J. Asiat. Soc. Bengal 43(2): 136. 1874; Jacobs in Steenis, Fl. Malesiana ser. 1, 5: 132. 1955. *Banisteria benghalensis* L., Sp. Pl. 427. 1753. *Hiptage madablota* Gaertner, Fruct. 2: 169, t. 116. 1791; Gamble, Fl. Madras 128(91). 1915.

Petiole 0.6-1 cm long; blade elliptic-ovate, to 14×7 cm. Inflorescence silky pubescent. Calyx gland convex, elliptic-oblong, partly adnate to the pedicel, dark colored. Petals reflexed, white, tinged with yellow or pink, crisped along the margin. Style slightly longer than the larger stamen. Wings of the fruit oblong; median wing to 3 cm long, lateral ones to 1.3 cm long.

Indomalaysia. Scattered across plain and in upper Ghats. September-March. *HFP* 1307, 1330.

103. POLYGALACEAE

T. P. Ramamoorthy

POLYGALA Linnaeus

Herbs, shrubs or trees. Leaves alternate; usually estipulate; blade entire, penninerved. Flowers irregular, pedicelled, bracteolate. Sepals unequal, persistent; outer 3 shorter, inner 2 larger and petaloid (wings). Petals 3, fused at base, the median (keel) carinate, 3-lobed or produced into a fimbriate crest below tip. Stamens 8, all fused below into flat, hyaline sheath; anther 1-celled by confluence, dehiscing by apical pore. Ovary 2-locular, superior, laterally compressed; ovule 1 per locule, pendulous; style elongate, curved; stigma entire or 2-4-lobed. Capsule flattened, winged or not, 2-seeded. Seeds usually black, villous or glabrous, tipped by a 2-3-lobed caruncle.

1 Raceme much longer than leaves.....*P. elongata*
1 Raceme shorter than or slightly longer than leaves.
2 Petaloid sepals falcate.....*P. arvensis*
2 Petaloid sepals obovate, symmetrical.....*P. persicariifolia*

Polygala arvensis Willd., Sp. Pl. 3(2): 876. 1802; Burtt, Notes Roy. Bot. Gard. Edinburgh 32: 404. 1973. *Polygala chinensis* auct. non. L.: Gamble, Fl. Madras 58(42). 1915; Adema, Blumea 14: 269. 1966.

Small herbs, with woody rootstock. Leaves sessile, 1-2×0.5 cm, ovate-obovate, sometimes linear. Racemes axillary, shorter or as long as, sometimes slightly longer than leaves. Flowers yellow. Petaloid sepals falcate. Petals 3. Capsule emarginate and symmetrical.

Continental S. Asia to Indomalaysia, including Indochinese Peninsula. Along

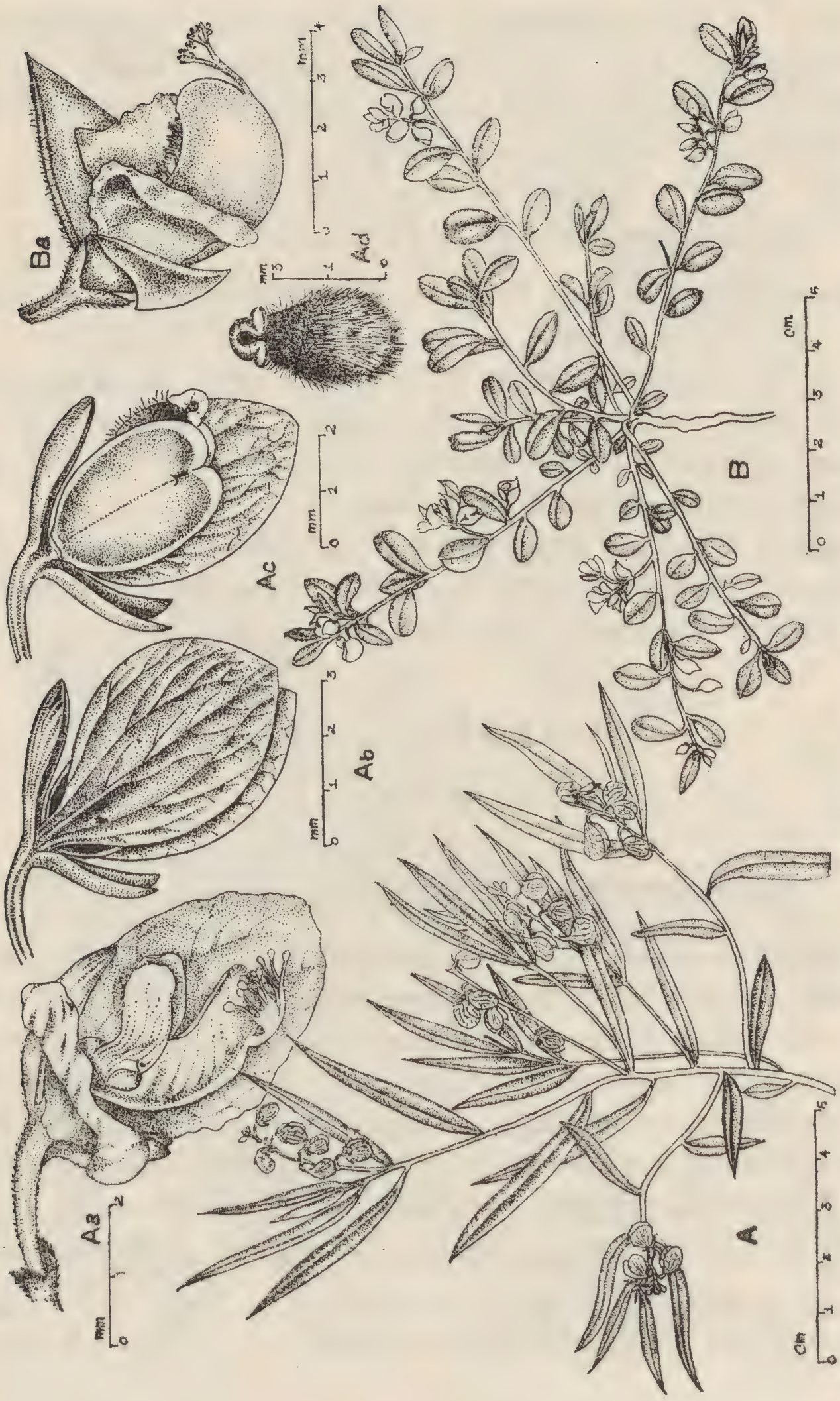


Fig. 81. POLYGALACEAE. *A.* *Polygala persicariifolia*: flowering plant; *Aa*, flower, showing corolla; *Ab*, same, showing calyx; *Ac*, fruit; *Ad*, seed. *B.* *Polygala arvensis*: habit; *Ba*, flower.

roadsides and in open waste lands, in plains and upper Ghats. It displays great variability. June-December. *CJS* 14508, 14702.

Polygala elongata Klein ex Willd., Sp. Pl. 3: 879. 1803; Gamble, Fl. Madras 58(42). 1915.

Erect herbs. Leaves subsessile, 3-6×0.2 cm, linear-lanceolate, apiculate-emarginate, hairy, membranous. Raceme usually terminal. Flowers yellow. Petaloid sepals falcate. Lateral two petals obovate. Capsule oblique at tip with one locule larger.

Indomalaysia. Fairly common, on moist, sandy soil, sometimes in open wastelands. August-November. *CJS* 17887, *HFP* 1942.

Polygala persicariifolia DC., Prodr. 1: 326. 1824; Gamble, Fl. Madras 58(42). 1915 ('*persicariaefolia*').

Slender herbs. Leaves sessile, 2-5×0.4-0.5 cm, linear-lanceolate, shortly acute, hairy. Racemes slender, terminal and axillary. Flowers pink or rose. Petaloid sepals obovate, symmetrical. Lateral petals obovate. Capsule emarginate, symmetrical.

Tropical Africa, Tropical Asia, including S. China, Malaysia. Fairly common in open wastelands or in shade of trees in deciduous forests of the western plains. October. *CJS* 9241, 15242.

104. ARALIACEAE

K. N. Gandhi

SCHEFFLERA J. & G. Forster *nom. cons.*

Trees or climbing shrubs. Leaves alternate; stipules usually intrapetiolar; blade usually palmately compound; leaflets usually entire. Inflorescence of umbels borne in racemes or panicles, crowded toward apices of twigs; bracts and bracteoles present. Flowers mostly bisexual, 5-9-merous; pedicels not articulated. Calyx truncate or toothed. Petals free, deciduous, valvate. Stamens inserted around disc. Ovary inferior, 5-9-locular; locule with solitary, pendulous ovule; styles short, free or combined into a column. Fruit a drupe, 5-9-angled; seeds compressed.

1 Leaflets prominently veined above; flowers 5-merous.....*S. venulosa*
1 Leaflets not prominently veined above; flowers 6-merous.....*S. wallichiana*

Schefflera venulosa (Wight & Arn.) Harms in Engl. & Prantl, Pflanzenfam. 3(8): 39. 1894; Gamble, Fl. Madras 570(403). 1919; Maheshwari, Bull. Bot. Surv. India 2: 376. 1960. *Paratropia venulosa* Wight & Arn., Prodr. 377. 1834.

Large stragglers. Leaflets elliptic-lanceolate, cuneate, 16-20×8 cm,

Fig. 82. ARALIACEAE. *A. Scheffelera wallichiana*: flowering twig; *Aa*, flower; *Ab*, same, vertical section; *Ac*, section of ovary; *Ad*, fruit.

coriaceous; main nerves distinct. Umbels 20-30 on raceme; peduncle 16-35 cm long; pedicel of umbel 2-3 cm long. Flowers 5-merous, pedicelled. Petals greenish-white. Ovary 5-locular; styles short, not connate. Drupes subglobose, brownish-black, 5 mm long.

Tropical and subtropical India, Burma, Yunnan, Indochina. Occasional in upper Ghats and western plains. April-June. *HFP* 109, 1626.

Schefflera wallichiana (Wight & Arn.) Harms in Engl. & Prantl, Pflanzenfam. 3(8): 38. 1894; Gamble, Fl. Madras 570(403). 1919.
Paratropia wallichiana Wight & Arn., Prodr. 377. 1834.

Usually stragglers or small trees. Leaflets elliptic-lanceolate, rounded, 9-14×5-8 cm, coriaceous; nerves faint. Umbels 12-15 on raceme; peduncle 14-18 cm long; pedicel of umbel 1.5 cm long. Flowers 6-merous, pedicelled. Petals white. Ovary 6-locular; styles short, not connate. Drupes ovoid, 4 mm long.

South India, Sri Lanka. Occasional along road cuts in upper Ghats and western plain. April-June. *CJS* 9755, 13476.

105. APIACEAE

K. N. Gandhi

Herbs. Stem often striated. Leaves alternate or radical; stipules present or absent; petiole usually sheathing; blade simple or compound; venation pinnate or palmate. Inflorescence umbellate, often subtended by involucral bracts. Flowers bisexual or polygamous, usually regular, 5-merous. Calyx adnate to ovary, truncate to lobed. Petals free, often incurved. Stamens inserted below the disc; filaments usually incurved in bud; anthers versatile. Ovary inferior, crowned by 2-lobed disc, 2-locular; locules with 1 pendulous ovule; styles 2, often dilated at base. Fruit a schizocarp of 2 mericarps separated by a commissure and ultimately attached to and pendulous from a carpophore; mericarps usually with 3-9 primary ribs, sometimes with secondary ribs between primary ones; pericarp often traversed by oil glands (vittae).

1 Leaves and umbels simple. Plants rooting at nodes.
2 Mericarps 3-ribbed; leaves lobed.....**Hydrocotyle**
2 Mericarps 5-many-ribbed; leaves unlobed.....**Centella**
1 Leaves (basal or upper ones) and umbels compound. Plant erect.
3 Inflorescence pubescent; mericarps winged.....**Heracleum**
3 Inflorescence glabrescent; mericarps not winged.....**Pimpinella**

CENTELLA Linnaeus

Rooting at nodes. Leaves simple, crenate, reniform, palmi-nerved.

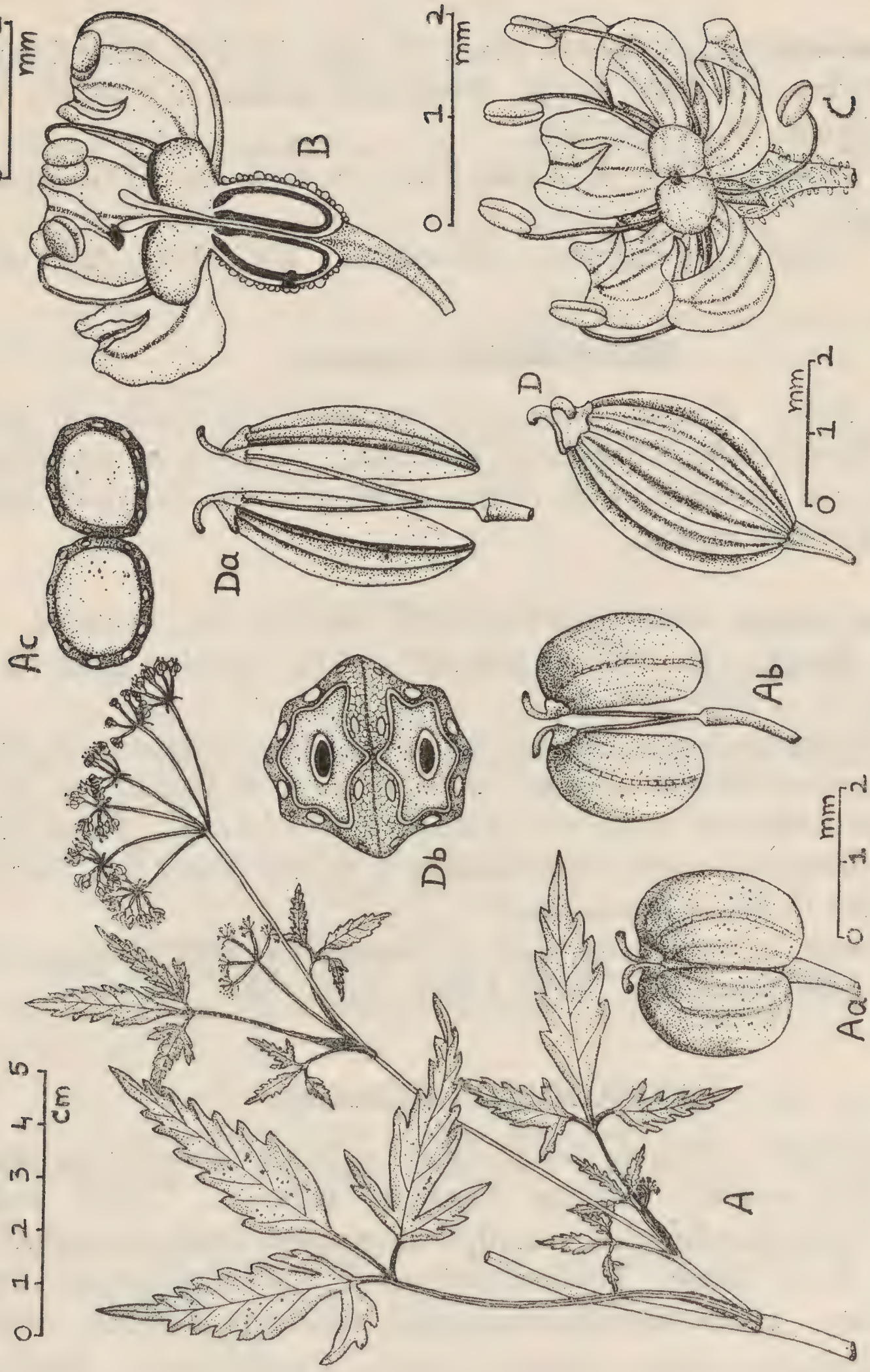


Fig. 83. APIACEAE. *A. Pimpinella heyneana*: flowering twig; *Aa*, *Ab*, fruit; *Ac*, same, in section. *B. Pimpinella wallichiana*: vertical section of flower. *C. Heracleum rigens*: flower. *D*, *Da*, *Anethum graveolens*: fruit; *Db*, same in section.

Umbel simple; involucral bracts 0-few. Flowers subsessile. Calyx truncate. Petals obtuse, imbricate. Fruits laterally compressed; mericarps with 5 primary ribs; secondary ribs 0-4, as distinct as primary ones; vittae 0.

Centella asiatica (L.) Urban in Mart., Fl. Bras. 11: 287. 1879; Gamble, Fl. Madras 556(392). 1919. *Hydrocotyle asiatica* L., Sp. Pl. 234. 1753; Wight, Ic. t. 565. 1842.

Trailing herbs. Petiole 2-15 cm; blade to 4×6 cm. Flowers few-many, brown.

Tropics. Common in marshes. All seasons. *CJS* 13731, *HFP* 1249.

HERACLEUM Linnaeus

Suberect herbs. Umbels compound; involucre and involucral bracts 0-many. Flowers often polygamous, pedicelled. Calyx truncate to lobed. Petals obovate. Fruits dorsally compressed; mericarps 5-ribbed; lateral ribs winged; vittae present.

Heracleum rigens Wall. [List 575. 1829, *nom.*] ex DC., Prodr. 4: 191. 1830; Gamble, Fl. Madras 564(399). 1919. *Pastinca rigens* (DC.) Wight, Ic. t. 1009. 1845.

Large, pubescent herbs. Lower leaves rosulate, compound; pinnae 1-3-paired, often 3-lobed, crenate, ovate, cordate, to 10×10 cm; upper leaves simple, otherwise as above. Umbels with 5-10 rays. Petals white. Mericarps elliptic-obovate; vittae usually 4 on the dorsal side (between the ribs) and to 10 on commissure.

Western Ghats. Common at peak of Vanagur, at 1000 m (upper Bisle Ghat). August-September. *CJS* 17822, *HFP* 1987.

HYDROCOTYLE Linnaeus

Rooting at nodes. Leaves simple; blade reniform-orbicular, palmately lobed, crenate-serrate, cordate; venation palmate. Umbel simple, solitary or few-many-fascicled, usually leaf-opposed, sessile or peduncled; involucral bracts 0-few. Flowers pedicelled. Calyx truncate. Petals acute, valvate. Fruits laterally compressed, mericarps 3-ribbed; vittae 0.

1 Leaves more than 3 cm across; umbels usually few-fascicled.....*H. javanica*
1 Leaves less than 3 cm across; umbels solitary.....*H. sibthorpioides*

Hydrocotyle javanica Thunb., Dissert. Hydroc. p. 3, No. 17, p. 6, t. 2. 1798; Dissert. Acad. 2: 415, t. 3. 1800; Gamble, Fl. Madras 556(392). 1919; Buwalda in Steenis, Fl. Malesiana ser. 1, 4: 115.

1949. *Hydrocotyle polycephala* Wight & Arn., Prodr. 366. 1834; Wight, Ic. t. 1003. 1845.

Pubescent runners, sometimes with ascending branches. Petiole 6-18 cm; blade distinctly lobed, to 8 cm across. Umbels few-fascicled; peduncle 0.5-3 cm long. Petals greenish-white.

Tropical Africa-Indomalaysia. Occasional in undergrowth of upper Ghats. August-October. *CJS* 15081, *HFP* 2719.

Hydrocotyle sibthorpioides Lam., Encycl. 3: 153. 1789; Buwalda in Steenis, Fl. Malesiana ser. 1, 4: 115. 1949. *Hydrocotyle rotundifolia* Roxb. ex DC., Prodr. 4. 64. 1830; Wight, Ic. t. 564. 1842; Gamble, Fl. Madras 556(392). 1919.

Stoloniferous herbs. Petiole 1-7 cm long; leaf blade sometimes peltate, slightly lobed, to 2.5 cm across. Umbel solitary; peduncle 1.5-2 cm long. Petals greenish-white.

Tropical Africa-Indomalaysia. Collected once in flower from marshy soil at Belur (plain) on 24 March 1969. *CJS* 13107.

PIMPINELLA Linnaeus

Erect herbs. Umbels compound, peduncled; involucral and involucel bracts 0-few, linear. Calyx shortly toothed. Petals often emarginate. Fruits laterally subcompressed; mericarps faintly-distinctly ribbed; vittae 2-3 between the ribs.

1 Flowers bisexual; fruit glabrous.....*P. heyneana*
1 Flowers polygamous; fruit papillose.....*P. wallichiana*

Pimpinella heyneana (DC.) Kurz, J. Asiat. Soc. Bengal 46: 115. 1877; Gamble, Fl. Madras 560(395). 1919. *Helosciadium heyneanum* DC., Prodr. 4: 106. 1830.

Leaves cauline, trifoliolate; leaflets serrate, ovate, cuneate, glabrescent, to 4 × 1.5 cm, sometimes lateral leaflets deeply divided. Involucral bracts absent; involucels 0-2. Flowers bisexual. Petals white. Fruit glabrous, ovoid.

Sri Lanka, South India, Burma. Fairly common, usually at base of bushes. November-January. *CJS* 12351, 15889.

Pimpinella wallichiana (Miq.) Gandhi *comb. nov.* *Helosciadium wallichianum* Miq., Bot. Zeit. 7: 775. 1849. *Pimpinella monoica* Dalzell, Hooker's J. Bot. Kew Gard. Misc. 3: 212. 1851; Gamble, Fl. Madras 560(395). 1919.

Tall herbs. Radical leaves sometimes present, simple; lower cauline leaves trifoliolate, with simple leaflets; upper cauline leaves segmented.

Involucral bract solitary; involucels 0-3. Flowers polygamous. Petals white. Fruit papillose.

South India (*lower*). Frequent in western plain and upper Ghats; usually in shaded places. August-January. *CJS* 11134, *HFP* 2181.

* * *

Anethum graveolens L. (incl. *A. sowa* Roxb.), 'Dill,' with yellow flowers, marginally 2-ribbed to 2-winged, somewhat laterally compressed fruits and *Coriandrum sativum* L., with white flowers, subglobose fruits are cultivated.

106. LOGANIACEAE

W. D. Stevens

Usually woody. Leaves opposite, simple, entire, with a stipular ridge between petioles, usually pinnately veined. Inflorescence usually of cymes. Flowers bisexual, 4- or 5-merous, gamosepalous and gamopetalous. Corolla lobes valvate or imbricate to the right in bud. Stamens inserted in the corolla tube; anthers usually 2-celled. Ovary superior, bilocular (sometimes incompletely) with 1-many axillary ovules; style slender, capitate. Fruit few-many-seeded, usually a berry. Seeds naked.

1 Flowers 4-merous.
2 Slender herbs, less than 10 cm in height; flowers white.....**Mitrasacme**
2 Woody twiners; flowers yellow.....**Gardneria**
1 Flowers 5-merous.
3 Corolla tube 40-50 mm long.....**Fagraea**
3 Corolla tube 2-2.5 mm long.....**Strychnos**

FAGRAEA Thunberg

Generally epiphytic when young; later becoming a small tree. Flowers 5-merous, in terminal corymbose cymes. Corolla funnel-form; lobes imbricate to the right. Stamens exserted. Berry with a translucent parchment-like rind which separates on drying. Seeds small, ovate.

Fagraea ceilanica Thunb., Kongl. Vetensk. Acad. Nya Handl. 3: 132. 1782; Gamble, Fl. Madras 865(608). 1923; Leenhouts in Steenis, Fl. Malesiana ser. 2, 6: 315. 1962. *Fagraea obovata* Wall. in Roxb., Fl. Ind. 2: 33. 1824; Gamble, *l.c.*. *Fagraea coromandelina* Wight, Ic. t. 1316. 1848. *Fagraea malabarica* Wight, Ic. t. 1317. 1848, *nom. illeg.*

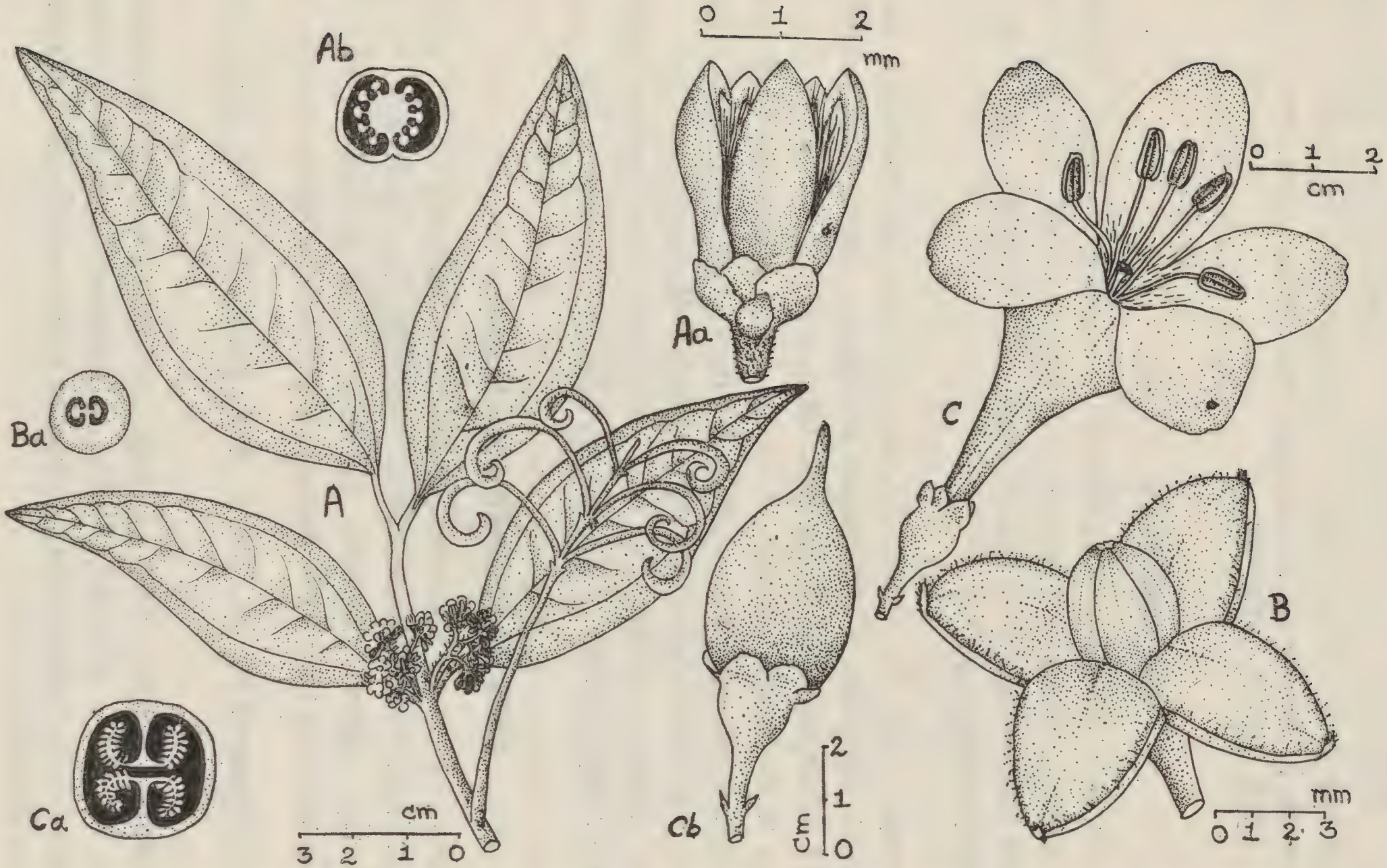


Fig. 84. LOGANIACEAE. *A. Strychnos dalzellii*: flowering branch; *Aa*, flower; *Ab*, ovary, cross section. *B. Gardneria ovata*: flower; *Ba*, ovary, cross section. *C. Fagraea ceilanica*: flower; *Ca*, ovary, cross section; *Cb*, fruit.

Leaves obovate to elliptic, mostly 10-15 cm long, glabrous or slightly pubescent below, base acute, apex obtuse or rounded. Calyx 10-15 mm long, glabrous; lobes rounded. Corolla white; tube 40-50 mm long; lobes 20 mm long, rounded. Berry ellipsoid to globose, 3-5 cm wide.

Indomalaysia. Occasional in wet forests. July-October. This plant may be bat pollinated; the flower have the characteristic features, and the edges of the corolla lobes are often damaged with what appear to be claw marks. *CJS* 13358, 14055, *HFP* 2855.

GARDNERIA Wallich

Climbing shrubs. Flowers 4-merous, in lateral cymes. Corolla rotate; lobes deltoid, densely pubescent within, valvate. Anthers subsessile, connate below and free above, exserted. Stigma bifid. Berry 2-seeded; seeds bowl-shaped.

Gardneria ovata Wall. in Roxb., Fl. Ind. 1: 400. 1820; Wight, Ic. t. 1313. 1848; Gamble, Fl. Madras 869(611). 1923; Leenhouts in Steenis, Fl. Malesiana ser. 2, 6: 363. 1962.

Leaves ovate to narrowly elliptic, 7-15 cm long, glabrous; base acute to obtuse; apex short acuminate. Calyx 1.5 mm long; lobes short ciliate. Corolla yellow with lobes 4-6 mm long. Berry 1-2 cm wide.

Indomalaysia. Fairly common in wet deciduous and semi-evergreen forests. January-September. *CJS* 14479, *HFP* 1565, *Stevens* 711.

MITRASACME Labillardiere

Annuals herbs. Flowers 4-merous, solitary or fascicled or in umbels. Corolla campanulate with valvate lobes. Stamens free, included. Styles 2, connate at tip; stigma capitate, bilobed. Fruit a globose capsule, truncate or 2-horned at tip; seeds many, ellipsoid to angular.

Mitrasacme pygmaea R. Br., Prodr. 453. 1810; Ohwi, Fl. Japan 734. 1965.

var. **malaccensis** (Wight) Hara, J. Jap. Bot. 30: 24. 1955; Backer & Bakh. f., Fl. Java 2: 208. 1965. *Mitrasacme malaccensis* Wight, Ic. t. 1601. 1850. *Mitrasacme polymorpha* auct. non R. Br.: Gamble, Fl. Madras 864(608). 1923.

Hispid. Leaves to 0.75 cm long, ovate, 1-nerved, serrulate. Umbel terminal or in upper axils. Calyx 0.6 mm long with acute lobes. Corolla tube 3-3.5 mm long; lobes white, rounded. Capsule 1.5 mm wide, truncate above, crowned by styles. Seeds ellipsoid, punctate.

India to Japan. Common in grasslands near Devalkere. October. *HFP* 2899.

STRYCHNOS Linnaeus

Plants often with tendrils. Leaves usually triplinerved. Flowers 5-merous, in corymbose cymes. Corolla campanulate, lobes valvate. Anthers often bearded at base. Berry 1- or sometimes 2-seeded, with a thick crustose rind.

1 Erect trees.....*S. potatorum*
1 Climbing shrubs.
2 Ovary and style completely glabrous.....*S. dalzellii*
2 Ovary and style hairy.....*S. colubrina*

Strychnos colubrina L., Sp. Pl. 189. 1753; Gamble, Fl. Madras 868(610). 1923.

Tendrils usually bifid. Leaves ovate to elliptic, acute at apex, rounded at base. Cymes axillary and on old wood. Corolla tube and lobes more or less equal; lobes 1.5 mm long, pilose at base on the inside. Ovary and style hairy.

Indomalaysia to Australia. Occasional. Collected once in middle Shiradi Ghat, along outskirts of semi-evergreen forests. October-November. *HFP* 920.

Strychnos dalzellii C. B. Clarke in J. Hooker, Fl. Brit. India 4: 87. 1883; Gamble, Fl. Madras 868 (610). 1923.

Tendrils simple, clavate. Leaves ovate to ovate-lanceolate, sometimes oblique, acute to shortly acuminate at tip, rounded at base. Cymes axillary. Calyx 1.5 mm long, puberulent on the outside and pilose within near base; lobes rounded with ciliate margins. Corolla tube and lobes equal in length. Berry 1-2 cm wide.

Peninsular India. Common in wet deciduous forests in Ghats. September-May. *CJS* 13024, 13132.

Strychnos potatorum L. f., Suppl. 148. 1781; Gamble, Fl. Madras 868(610). 1923.

Erect trees. Leaves elliptic, acute at both ends, with a pair of ribs above the basal 3. Cymes usually on old wood. Corolla tube longer than lobes. Ovary and style glabrous. Fruit 1-1.5 cm wide.

Burma, Central & Peninsular India, Sri Lanka. Locally common in dry deciduous forests on Nagpuri hills. September-June. *HFP* 155, 1275.

107. GENTIANACEAE

T. P. Ramamoorthy

Herbs, usually bitter; stem usually quadrangular. Leaves opposite, estipulate, usually entire, palmately veined. Inflorescence usually

Fig. 85. GENTIANACEAE. *A. Centaurium roxburghii*: habit; *Aa*, flower; *B. Swertia corymbosa*: petal with stamen; *Ba*, section of ovary. *C. Hoppea dichotoma*: habit; *Ca*, dissected flower. *D. Canscora perfoliata*: flower; *Da, Canscora decussata*: flower.

bracteate. Flowers usually bisexual, 4-5-merous, usually regular. Calyx mostly imbricate, persistent. Corolla lobes usually equal, valvate or imbricate, somewhat persistent. Stamens epipetalous, alternating with lobes. Ovary superior, 1-locular with many ovules on 1-3 parietal placentas; style present or absent; stigma sometimes bilobed. Fruit a bivalved, many-seeded capsule, sometimes baccate and indehiscent.

1 Flowers irregular.
2 Tiny herbs, with sessile flowers; stamen 1 ..... **Hoppea**
2 Herbs larger, with stalked flowers; stamens 4 ..... **Canscora**
1 Flowers regular.
3 Petals glandular below on the inside ..... **Swertia**
3 Petals eglandular.
4 Calyx lobes 5, linear, deeply partite; anthers spirally twisting after dehiscence ..... **Centaurium**
4 Calyx lobes 4, not linear, not deeply partite; anthers not spirally twisting after dehiscence ..... **Exacum**

CANSCORA Lamarck

Inflorescence in cymes, sometimes of solitary flowers; bracts sometimes foliaceous. Flowers 4-merous, irregular. Calyx sometimes winged on back; corolla lobes unequal, imbricate. Staminal filaments unequal; one produced into a clavate tip, which bears the anther on a filamentella. Style simple, linear; stigma globose, 2-lobed. Capsule septicidally 2-valved or dehiscing irregularly; seeds many.

1 Stem 4-angled, but not winged ..... *C. diffusa*
1 Stem 4-winged.
2 Bracts perfoliate ..... *C. perfoliata*
2 Bracts not perfoliate.
3 Pedicels winged ..... *C. decussata*
3 Pedicels not winged ..... *C. decurrens*

Canscora decurrens Dalzell, Hooker's J. Bot. Kew Gard. Misc. 2: 136. 1850; Gamble, Fl. Madras 878 (617). 1923.

Herbs to 30 cm. Stem winged. Leaves to 3×1 cm, elliptic, acute at both ends. Pedicel and calyx not winged. Corolla pink.

South W. India. Fairly common herbs in rocky, moist, sandy terrain, sometimes amongst grasses in western plains and upper Ghats. October-November. *CJS* 15757, *HFP* 2457.

Canscora decussata Schultes & Schultes, Mant. 3: 229. 1827; Gamble, Fl. Madras 879 (618). 1923.

Herbs to 28 cm. Stem 4-winged. Leaves to 2.5×1 cm, ovate, acute, scabrid along margin. Flowers solitary; pedicel and calyx winged. Corolla white.

Tropical Africa, Madagascar, India. Occasional. In shade at edges of forests or in the open in western plains (Byra, Harihalli). October. *CJS* 9277, 15224.

Canscora diffusa (Vahl) R. Br., Prodr. 451. in obs. 1810. Gamble, Fl. Madras 878(617). 1923. *Gentiana diffusa* Vahl, Symb. Bot. 3: 47. 1794. *Canscora lawii* Wight, Ic. t. 1327. 1848.

Herbs to 25 cm; stem 4-angled, not winged. Leaves 1-3.5×0.5-1.2 cm, ovate, elliptic, narrowed at both ends. Flowers in fascicles, sometimes solitary. Corolla pink.

Tropical Africa to Indomalaysia. Common in western plains and Ghats, in well-drained, open places. December-January. *CJS* 12199, 15772.

Canscora perfoliata Lam., Encycl. 1: 601. 1785; Gamble, Fl. Madras 879(618). 1923. *Canscora grandiflora* Wight, Ic. t. 1326. 1848.

Herbs to 40 cm; stem winged. Leaves to 3.5×1.5 cm, elliptic, acute at both ends. Bracts united, perfoliate. Flowers in fascicles or solitary. Pedicel and calyx winged. Corolla pink.

South W. India. Common in shade or partial shade, along roadsides or forest clearings in Ghats. October-April. *CJS* 12419, 16463.

Note: *CJS* 15529, from lower Bisle Ghat has an 8-winged calyx.

CENTAURIUM Hill

Stem obscurely winged. Inflorescence of dichasial cymes. Flowers usually 5-merous, regular, stalked. Calyx deeply partite. Corolla constricted near mouth; lobes subequal, rotate. Anther twisting spirally after dehiscence. Ovary linear; style linear; stigma bilobed. Capsule bivalved, many-seeded.

Centaurium roxburghii (G. Don) Druce, Bot. Exch. Club Soc. Brit. Isles 4: 614. 1916; Sant., Fl. Khandala ed. 3, 161. 1967. *Erythraea roxburghii* G. Don, Gen. Syst. 4: 106. 1837; Wight, Ic. t. 1325. 1848; Gamble, Fl. Madras 875(615). 1923.

Erect branching herbs to 32 cm. Leaves 4×0.5 cm, lanceolate acute, subcordate at base. Calyx lobes keeled, linear, acuminate; corolla lobes elliptic rounded, white.

India. Fairly common in and near fields. All seasons. *CJS* 14270, 16298.

EXACUM Linnaeus

Inflorescence of dichasial cymes; occasionally flower solitary. Flowers 4-5-merous regular. Calyx lobes winged on back or not. Corolla lobes contorted. Anthers dehiscing by apical pores. Ovary 2-locular by

intruding placentae; ovules many. Capsule septicidally 2-valved, globose, many-seeded.

1 Calyx not winged.....*E. sessile*
1 Calyx winged.
2 Leaves distinctly petioled.....*E. carinatum*
2 Leaves all sessile.
3 Corolla 2 cm long.....*E. bicolor*
3 Corolla less than 1 cm long.
4 Cymes many-flowered; pedicel long.....*E. pedunculatum*
4 Cymes few-flowered; pedicel short.....*E. pumilum*

Exacum bicolor Roxb., Fl. Ind. 1: 413. 1820; Wight, Ic. t. 1321. 1848; Gamble, Fl. Madras 873(614). 1923.

Erect herbs to 0.5 cm. Leaves sessile to 9×2.5 cm, elliptic-oblong, acute, 3-5-nerved from base. Inflorescence usually dense, many-flowered cymes; occasionally flower solitary. Calyx 4-lobed, winged on back; corolla showy; lobes 4, broadly ovate-acute, white with dark purple tip.

Peninsular India. Common in open grasslands. September-January. *CJS* 15129, *HFP* 743.

Exacum carinatum Roxb., Fl. Ind. 1: 415. 1820. *Exacum petiolare* Griseb. in DC., Prodr. 9: 46. 1845; Wight, Ic. t. 1324(2). 1848; Gamble, Fl. Madras 874(614). 1923.

Herbs to 0.3 m. Leaves petioled, elliptic, acute at both ends or ovate, acuminate, 3-nerved. Cymes few-flowered. Calyx 4-lobed; corolla 4-lobed, pale blue.

Central and South W. India. Occasional in Shiradi Ghat, in partial or full sun on clayey soil, along roadsides and roadcuts. October. *CJS* 15320, *HFP* 916.

Note: The revival of Roxburgh's name is desirable, as his and Grisebach's *E. petiolare* seems to be one and the same (cf. C. B. Clarke, in J. Hooker, *Fl. Brit. India* 4: 98. 1883).

Exacum pedunculatum L., Sp. Pl. 111. 1753; Wight, Ic. t. 336. 1840; Gamble, Fl. Madras 874(614). 1923.

Erect annuals to 0.3 m. Leaves to 4×1 cm, oblong, elliptic, 3-nerved. Cyme many-flowered; flower pedicelled. Calyx 4-lobed, winged; corolla lobes 4, blue.

India. Common in open moist places in plains. August-February. *CJS* 12180, 15719.

Exacum pumilum Griseb. in DC., Prodr. 9: 46. 1845; Wight, Ic. t. 1324(3). 1848.

Herbs reaching 15 cm. Leaves sessile, 1.5×0.5 cm, ovate, 3-nerved. Cymes few-flowered; flowers subsessile. Calyx 4-lobed, winged; corolla 4-lobed, blue.

South W. India. Fairly common on Shiradi Ghat, on open grassy hillsides. September-October. *CJS* 14761, 15125.

Note: *Exacum lawii* can be expected in the District and is distinguished by the slender unbranched stem.

Exacum sessile L., Sp. Pl. 112. 1753; Wight, Ic. t. 1324(1). 1848; Gamble, Fl. Madras 874(614). 1923.

Slender herbs to 6-14 cm. Leaves sessile, broadly ovate. Cyme few-flowered. Calyx not winged; corolla blue.

Peninsular India, Sri Lanka. Fairly common in open grassy hillsides in Ghats. September-October. *CJS* 15098, 15159.

HOPPEA Willdenow

Tiny herbs. Leaves sessile. Inflorescence axillary or terminal, or 2-3-chotomous cymes with sessile or shortly pedicelled flowers. Flowers 4-merous, irregular. Calyx sometimes longer than corolla. Corolla lobes unequal. Stamen 1; anther globose; rarely with 3 staminodes. Ovary globose; style very short; stigmas 2, recurved. Capsule globose or ellipsoid, bivalved, many-seeded.

1 Stem 4-angled; corolla included ..... *H. dichotoma*
1 Stem 4-winged; corolla exserted ..... *H. fastigiata*

Hoppea dichotoma Willd., Ges. Naturf. Freunde Berlin Neue Schriften 3: 435. 1801; Gamble, Fl. Madras 877(616). 1923.

Leaves 0.6×0.4 cm, ovate. Corolla shorter than calyx, white.

India. Common in open moist places in plains and upper Ghats. October-December. *CJS* 15212, 15351.

Hoppea fastigiata (Griseb.) C. B. Clarke in J. Hooker, Fl. Brit. India 4: 100. 1883; Gamble, Fl. Madras 877(616). 1923. *Cicendia fastigiata* Griseb., Gentia. 158. 1839.

Stem 4-winged. Leaves 0.5×0.3 cm, ovate. Corolla longer than calyx, white.

Central & S. India, Sri Lanka. Occasional in open grasslands on Ghats. October. *CJS* 15131, 15312.

SWERTIA Linnaeus

Leaves sessile. Inflorescence a terminal panicle of corymbs. Flowers 4-5-merous, regular. Calyx deeply partite. Corolla lobes rotate, twisted to right in bud, with nectariferous glands at base on the inside. Style short or none; stigma bilobed. Fruit a globose, elliptic, many-seeded, bivalved capsule.

Swertia corymbosa (Griseb.) C. B. Clarke in J. Hooker, Fl. Brit. India 4: 126. 1883; Gamble, Fl. Madras 881(619). 1923. *Ophelia corymbosa* Griseb., Gentia. 317. 1839; Wight, Ic. t. 1329. 1848.

Annuals to 0.85 m. Leaves to 3×1 cm, ovate-lanceolate, acute. Corymbs terminal, axillary. Calyx 4-partite, not winged. Corolla 4-lobed, purple. Ovary with intruding placentas.

South W. India. Common on open grassy hillsides in Ghats. October-December. *CJS* 15506, 15622.

108. APOCYNACEAE

W. D. Stevens

Trees, shrubs, erect herbs, or scandent or twining vines. Sap usually milky. Leaves usually opposite, simple, entire, pinnately reticulate-veined, usually estipulate. Flowers bisexual, 5-merous, actinomorphic, gamosepalous and gamopetalous, in terminal or lateral cymes or corymbs. Calyx often with basal glands within. Corolla lobes imbricate in bud. Stamens inserted in the corolla tube; anthers sometimes sagittate with sterile tails, free or connivent and adnate to the stigma. Stigma single, often enlarged and elaborated; style single mostly thin. Ovaries 2 and unilocular or 1 and bilocular, superior or sometimes partly submerged in a receptacle. Fruits mostly follicles, sometimes drupes, berries, or capsules. Seeds comose at one or both ends, winged, arillate or naked.

1 Leaves whorled or alternate; corolla with or without faucal scales.
2 Leaves alternate; corolla lobes imbricate to the left in bud.....**Plumeria**
2 Leaves whorled; corolla lobes imbricate to the right or left.
3 Anthers sagittate, with sterile tails and a long terminal pilose appendage; leaves linear lanceolate.....**Nerium**
3 Anthers ovate or sagittate, but without sterile tails or such an appendage; leaves wider .....**Alstonia**
1 Leaves opposite; corolla without faucal scales.
4 Plants with long sharp spines; fruit a fleshy berry.....**Carissa**
4 Plants without spines; fruits follicular.
5 Plants erect; ovaries 2.
6 Plants herbaceous; ovaries pubescent.....**Catharanthus**
6 Plants woody; ovaries glabrous.
7 Corolla tube pubescent; stamens inserted near the base; seeds comose.....**Holarrhena**
7 Corolla tube glabrous; stamens inserted near the top; seeds arillate....**Ervatamia**
5 Plants scandent or twining; ovaries 1 or 2.
8 Corolla more than 5 cm long.
9 Corolla funnelform; lobes imbricate to right.....**Beaumontia**
9 Corolla salverform; lobes twisted to left.....**Chonemorpha**
8 Corolla less than 4 cm long.

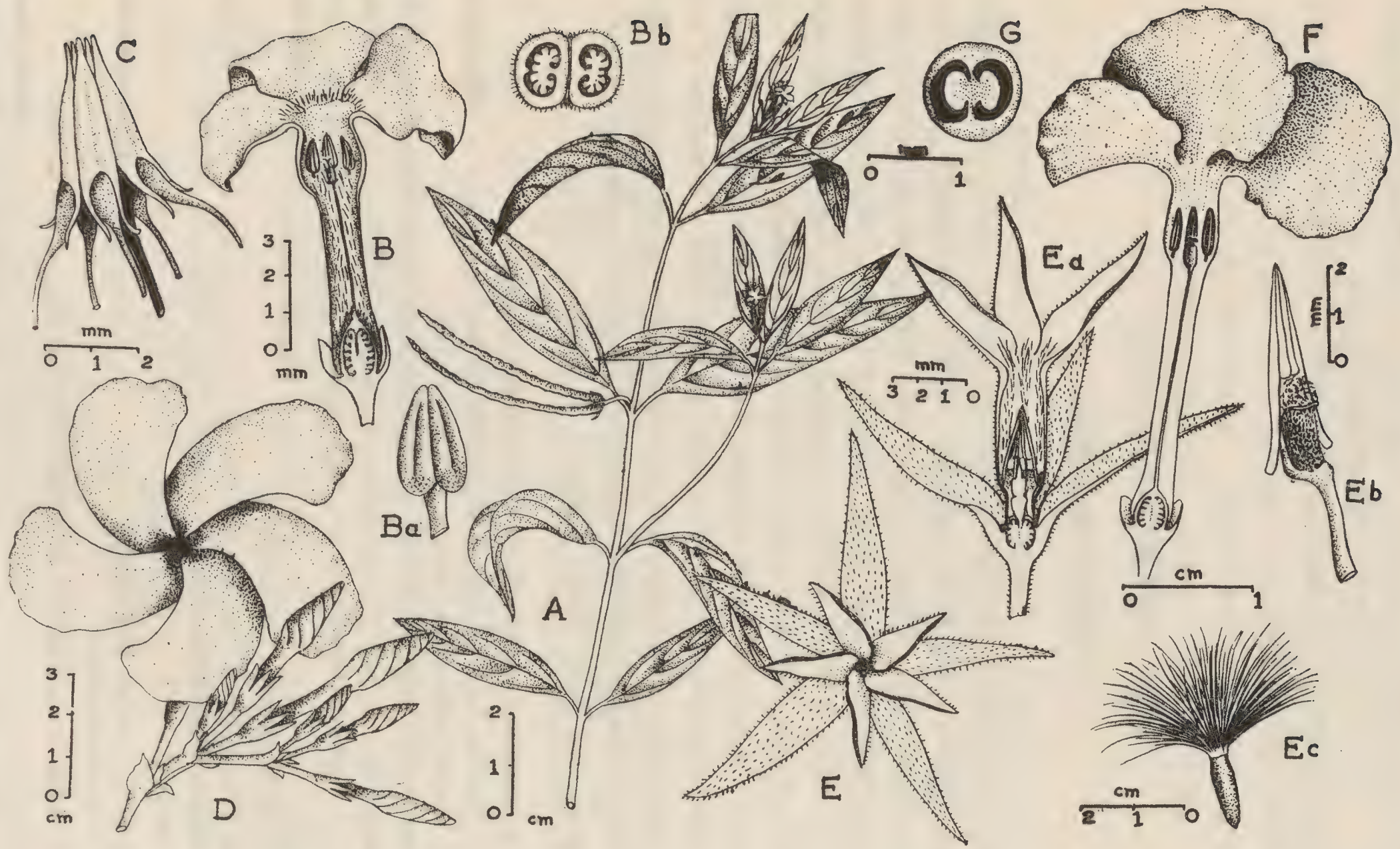


Fig. 86. APOCYNACEAE. *A. Catharanthus pusillus*: plant in flower. *B. Alstonia scholaris*: flower, vertical section; *Ba*, stamen; *Bb*, ovary, cross section. *C. Beaumontia jerdoniana*: connivent anthers adnate to stigma. *D. Chonemorpha fragrans*: flower. *E. Aganosma cymosa*: flower, top view; *Ea*, same, vertical section; *Eb*, anther; *Ec*, seed. *F. Ervatamia heyneana*: flower, vertical section. *G. Carissa paucinerva*: ovary, cross section.

10 Primary veins many, parallel, joining an intramarginal vein.....**Chilocarpus**
10 Primary nerves few, not parallel; intra-marginal veins absent.
11 Filaments spirally twisted around style; ovary 1.....**Parsonsia**
11 Filaments obsolete; ovaries 2.
12 Corolla yellow-brown; tube about 6 mm long, fluted; sap milky.....**Aganosma**
12 Corolla white or tinted rose; tube 3-4 mm long, narrow at the base and apex and inflated in between; sap watery.....**Ichnocarpus**

AGANOSMA G. Don

Scandent or sometimes twining woody shrubs. Cymes terminal, corymbose. Calyx mostly with small subulate glands at the sinuses. Corolla fluted-tubular from a narrow base, pubescent on the outside and with rows of bristles above the anthers on the inside; lobes imbricate to the right. Stamens inserted in the base of the widened part of the tube; filaments obsolete; anthers sagittate with sterile bases, connivent and adnate to the stigma. Stigma conical, glabrous; ovaries separate, pubescent; nectary of 5 more or less connate scales enclosing the ovaries. Fruit of paired falcate follicles, widely divergent; seeds comose.

Aganosma cymosa (Roxb.) G. Don, Gen. Syst. 4: 77. 1837-1838; Wight, Ic. t. 1304, 1306. 1848; Gamble, Fl. Madras 819(576). 1923.
Echites cymosa Roxb., Fl. Ind. 2: 16. 1832; Wight, Ic. t. 395. 1840.

Leaves elliptic to ovate or obovate, 5-15 cm long, glabrous to sparsely pubescent; base rounded to acute; apex acute and slightly acuminate to rounded or emarginate. Corolla yellowish-brown; tube about 6 mm long; lobes ovate-lanceolate, 7-12 mm long. Follicles 10-15 cm long.

India, Sri Lanka. Common in plains and Ghats. April-October. *CJS* 13804, *Stevens* 494.

Note: Our specimens differ in some respects from previous descriptions, but this is apparently a rather variable species over its range.

ALSTONIA R. Brown *nom. cons.*

Large tree. Leaves whorled, 4-7 per node. Cymes terminal and lateral, paniculate. Calyx eglandular. Corolla salverform, pilose at the mouth; lobes imbricate to the right or left. Stamens inserted near the top of the tube; filaments short; anthers ovate with an acute apex, somewhat connivent but not adnate to the stigma. Stigma slightly enlarged, bifid, glabrous; ovaries separate, pubescent. Fruit of thin, parallel or slightly divergent paired follicles; seeds comose at both ends.

Alstonia scholaris (L.) R. Br., Mem. Wern. Nat. Hist. Soc. 1: 76. 1811 (1810); Wight, Ic. t. 422. 1840-1843; Gamble, Fl. Madras 810(569). 1923. *Echites scholaris* L., Mant. 53. 1767.

Leaves oblong-elliptic to oblanceolate, 7-12 cm long, glabrous, base acute to slightly obtuse, apex rounded to emarginate. Corolla greenish-white; tube 6-9 mm long, pubescent, pilose at the mouth, lobes cuneate, oblong, 2.5 mm long. Follicles 20-50 cm long.

S. Asia through Malaysia to Australia and Melanesia. Common trees in Ghats. The sap is apparently quite poisonous and the tree is feared by the inhabitants of some areas. In other areas, however, the bark is collected and used for medicinal purposes. December-March. *CJS* 13084, 16002.

BEAUMONTIA Wallich

Scandent woody vine. Cymes terminal. Calyx with numerous basal glands within. Corolla funnelform, tube pubescent outside, glabrous within; lobes imbricate to the right. Stamens inserted below the middle of the tube; filaments thickened immediately below the anther; anthers sagittate with sterile incurved bases, connivent and adnate to the stigma. Stigma fusiform, glabrous; ovary single, bilobed and bilocular, pubescent; nectary of 5 rounded ciliate scales. Fruit of paired follicles (appearing to be 1 until separation at maturity); seeds comose.

Beaumontia jerdoniana Wight, Ic. t. 1314-1315. 1848; Gamble, Fl. Madras, 817(575). 1923.

Leaves oblong ovate, 15-30 cm long, at first rusty tomentose, later nearly glabrous; base acute; apex abruptly acuminate. Corolla white; tube 60-70 mm long, pubescent outside, glabrous within; lobes oblique, short-acuminate, 30-40 mm long. Filaments to 35 mm long. Follicles 20-25 cm long.

Central South W. India. In Hassan collected only once, in wet forest of Bisle Ghat. January. *CJS* 16005.

Note: This plant is somewhat larger in most dimensions than indicated for the species in previous descriptions.

CARISSA Linnaeus *nom. cons.*

Erect or scandent spinous, woody shrub. Leaves glabrous. Cymes terminal. Calyx eglandular. Corolla salverform, white; tube pubescent within; lobes lanceolate, imbricate to the right. Stamens inserted near the top of the tube; filaments short; anthers oblong, apiculate, free. Stigma fusiform, apically bifid, pubescent; ovary single, bilocular, glabrous. Fruit a fleshy berry; seeds naked.

1 Leaves mostly less than 3 cm long; berry ellipsoid, 2-seeded..... *C. paucinerva*
1 Leaves mostly more than 3 cm long; berry spherical or slightly ellipsoid, 4-seeded.

2 Spines distinctly recurved.....*C. inermis*
2 Spines straight or slightly curved.....*C. congesta*

Carissa congesta Wight, Ic. t. 1289. 1848; Gamble, Fl. Madras 805 (565). 1923.

Sometimes scandent. Spines straight or slightly curved. Leaves broadly ovate, 3-7 cm long; base cuneate to slightly rounded; apex bluntly acute, mucronate. Corolla tube 10-15 mm long; lobes 5-7 mm long. Berry spherical or slightly ellipsoid, to 3 cm wide, 4-seeded.

Peninsular India. Apparently not common in Hassan; collected once at Bagi in fruit. August. *Stevens* 588.

Carissa inermis Vahl, Symb. Bot. 3: 43. 1794; Gamble, Fl. Madras 805(565). 1923.

Scandent. Spines recurved. Leaves ovate to elliptic-lanceolate, 5-9 cm long; base rounded or sometimes obtuse or acute; apex acute to slightly acuminate, occasionally emarginate. Corolla tube 10-20 mm long; lobes 5-10 mm long. Berry spherical or slightly ellipsoid, to 3 cm wide, 4-seeded.

Peninsular India. Common in Ghats, especially in secondary growth. March-August. *CJS* 10777, *Stevens* 642, 724.

Carissa paucinerva A. DC. in DC., Prodr. 8: 333. 1844; Wight, Ic. t. 1290. 1848; Gamble, Fl. Madras 806(566). 1923.

Erect. Spines straight. Leaves elliptic-ovate to elliptic-lanceolate, 1.5-3.5 cm long; base acute; apex acute, mucronate. Corolla sometimes tinted rose; tube 10 mm long; lobes to 4 mm long. Berry ellipsoid, 2-seeded.

Peninsular India. Common in scrub and dry deciduous forest in plains. February-September. *CJS* 9003, 9743, *Stevens* 758.

Note: The fruits of these species, as well as some others in the genus, have a pleasant flavor and are eaten fresh or in jams. *Carissa carandas* is widely cultivated for its fruits and may be found in the District.

CATHARANTHUS G. Don

Note: The problem of the names *Lochnera* and *Catharanthus* has been a perplexing one. The last and most convincing survey and discussion is by Stearn (*Lloydia* 29: 196-200. 1966) whom we follow.

Erect annual or perennial herbs, sometimes slightly woody below. Cymes lateral. Calyx eglandular. Corolla salverform; lobes cuspidate, imbricate to the left. Stamens inserted near the top of the tube; filaments short; anthers oblong with slightly sagittate but fertile bases, free. Stigma cylindric with a pendent basal collar, pubescent; ovaries separate, pubescent; nectary of 2 erect glands. Fruit of paired follicles; seeds with muricate ribs, otherwise naked.

1 Corolla tube less than 10 mm long; follicles glabrous, more than 30 mm long. . *C. pusillus*
1 Corolla tube more than 20 mm long; follicles pubescent, less than 30 mm long. . *C. roseus*

Catharanthus pusillus (Murr.) G. Don, Gen. Syst. 4: 95. 1837-1838. *Vinca pusilla* Murr., Novi Comment. Soc. Regiae Sci. Gott. 3: 66. 1773; *Lochnera pusilla* K. Schumann in Engl. & Prantl, Pflanzenfam. 4(2): 145. 1895; Gamble, Fl. Madras 809(568). 1923.

Leaves lanceolate, 4-7 cm long, glabrous; base attenuate; apex acuminate. Cymes 1-2-flowered. Corolla white; tube 6-9 mm long, the mouth pilose within, otherwise glabrous; lobes obovate, about 2 mm long. Follicles thin, glabrous, 35-50 mm long.

India, Sri Lanka. Common in dry cultivated fields. July-December. *CJS* 11971.

Catharanthus roseus (L.) G. Don, Gen. Syst. 4: 95. 1837-1838; Backer & Bakh. f., Fl. Java 2: 227. 1963. *Vinca rosea* L., Syst. Nat. ed. 10, 944. 1759; *Lochnera rosea* Reichenb., Consp. Regni Veg. 134. 1828; Gamble, Fl. Madras 809(569). 1923.

Leaves elliptic to obovate, 3-8 cm long, pubescent; base acute; apex obtuse or rounded, cuspidate. Cymes 1-4-flowered. Corolla mostly rose but sometimes with other colors or color combinations; tube 25-30 mm long, pubescent outside, pilose within except at the level of the anthers; lobes broadly ovate, 15-25 mm long. Follicles thickened, pubescent, 20-30 mm long.

Probably native to Madagascar but now cultivated and naturalized throughout the Tropics. Common in gardens and occasionally found wild. August-January. *CJS* 12313.

CHILOCARPUS Blume

Climbing shrubs. Veins many, approximate, joining an intramarginal vein, not anastomosing. Inflorescence axillary, of branching cymes. Calyx deeply lobed, imbricate. Corolla lobes twisted to left in bud. Stamens inserted around middle of corolla tube; anthers free. Ovary 1-locular; ovules many, on 2 parietal placentas. Fruit an elongate, fleshy berry with a thick pericarp.

Chilocarpus atrovirens (G. Don) Blume, Mus. Bot. Lugd.-Bat. 1: 153. 1850 ('*atroviridis*'); Gamble, Fl. Madras 802(564). 1919 ('*atroviridis*'). *Hunteria atrovirens* G. Don, Gen. Syst. 4: 105. 1837-1838; DC., Prod. 8: 351. 1844 ('*atroviridis*'). *Chilocarpus malabaricus* Bedd., Ic. t. 175. 1874.

Leaves to 15 cm long, elliptic-oblong, cuspidate, rounded below. Branches of inflorescence trichotomous; pedicels bracteate at base.

Corolla bright orange, inflated above middle; lobes rounded. Anthers subsessile. Berry fleshy, to 7 cm long; seeds embedded in pulp.

South W. India in Malabar, now Kenchankumri State Forest in middle Shiradi Ghat. Locally common in shade, on large trees. March-April. *HFP* 1487, 1539.

Note: This taxon has generally been known as *Chilocarpus atroviridis* (DC.) Blume. Specimens of *Wallich* 1614 (*List.* 1614. 1829, *nom.*) were distributed as *Hunteria atroviridis*. G. Don (1837) was the first to validly publish the taxon but as *H. atrovirens*, referring to *Wallich* 1614. Later publications such as *Hunteria atroviridis* DC. (1844) and *Chilocarpus atroviridis* (DC.) Blume include *H. atrovirens* G. Don in synonymy. Since the types are the same it seems appropriate to adopt the earliest validly published spelling wherever necessary.

CHONEMORPHA G. Don *nom. cons.*

Lofty climbers. Flowers usually in terminal lax cymes. Calyx glandular at base within. Corolla large, salver-shaped; lobes twisted to left in bud. Stamens included; anthers acuminate, sagittate below. Carpels 2; style short; stigma bifid. Follicles long.

Chonemorpha fragrans (Moon) Alston, Ann. Roy. Bot. Gard. (Peradeniya) 11: 203. 1929. *Echites fragrans* Moon, Cat. Pl. Ceylon 20. 1824. *Echites macrophylla* Roxb., Fl. Ind. 2: 13. 1832. *Chonemorpha macrophylla* (Roxb.) G. Don, Gen. Syst. 4: 76. 1837; Wight, Ic. t. 432. 1841; Gamble, Fl. Madras 818(575). 1923.

Leaves to 26 cm long, broadly oblong, cordate at base, tomentose beneath. Calyx lobes oblong, ciliate. Corolla to 7.5 cm long; lobes broadly rounded, cuneate, white. Filaments flat, pilose. Stigma conical.

Indomalaysia. Occasional in lower Bisle Ghat. January-May. *HFP* 1664, 2863.

ERVATAMIA Stapf

Large shrub or small tree. Cymes terminal or lateral, corymbose. Calyx with subulate basal glands within. Corolla salverform; lobes imbricate to the right. Stamens inserted near the top of the tube; filaments obsolete; anthers linear-oblong with short bilobed bases, free. Stigma slightly enlarged, bifid, glabrous; ovaries separate, glabrous. Fruit of paired boat-shaped follicles; seeds with a bright red aril.

Ervatamia heyneana (Wall.) Cooke, Fl. Bombay 2: 134. 1904; Gamble, Fl. Madras 813(572). 1923. *Tabernaemontana heyneana* Wall., Edward's Bot. Reg. 15: t. 1273. 1829.

Leaves elliptic to lanceolate, 10-20 cm long, glabrous; base acute; apex acuminate. Corolla white, tube 15-30 mm long, glabrous; lobes obtuse, crispate or frilled, about 10 mm long. Follicles 2.5-3.5 cm long, bright yellow-orange at maturity.

South W. India. A very common and distinctive second growth species of the Ghats. The seeds of this species are well adapted for distribution by birds and this is perhaps a factor in its success as a second growth species. Probably pollinated by night-flying moths. December-August. *CJS* 10120, *Stevens* 610.

HOLARRHENA R. Brown

Shrub or small tree. Cymes terminal or lateral, corymbose. Calyx with small basal glands within. Corolla salverform; lobes imbricate to the left. Stamens inserted near the base of the tube; filaments short; anthers linear-oblong, free. Stigma not thickened, conical, glabrous; ovaries separate, glabrous. Fruit of paired follicles, somewhat divergent; seeds comose.

Holarrhena antidysenterica (Roth) A. DC. in DC., Prodr. 8: 413. 1844; Gamble, Fl. Madras 811(570). 1923. *Echites antidysenterica* Roth, Nov. Pl. Sp. 138. 1821; Wight, Ic. t. 1297-1298. 1848; *Chonemorpha antidysenterica* (Roth) G. Don, Gen. Syst. 4: 76. 1837-1838; Wight, Ic. t. 439. 1840-1843.

Leaves broadly ovate to elliptic, 10-25 cm long, pubescent or glabrous; base rounded to obtuse; apex acuminate. Corolla white; tube about 10 mm long, pubescent; lobes oblong, mostly 12-14 mm long. Fruit 20-40 cm long.

India, Malay Peninsula. Locally common in hills in plains and Ghats. The plant is rich in alkaloids. A preparation of the bark is a well known and effective treatment for dysentery. The plant is generally listed under the invalid name *H. antidysenterica* Wall., which lacked a description and was based on an unpublished name, *Echites antidysenterica* Roxb. March-October. *CJS* 11758, 13273, 14090.

ICHNOCARPUS R. Brown *nom. cons.*

Woody twining vine. Cymes terminal or lateral. Calyx eglandular. Corolla tubular; tube narrow at the base and apex and inflated in the middle; mouth and margins of lobes pubescent; lobes broad with a long thin acumination, imbricate to the right with the acumination reflexed. Stamens inserted near the middle of the tube; filaments obsolete; anthers sagittate with sterile bases, connivent around and adnate to the stigma.

Stigma ovoid, glabrous; ovaries separate, pubescent; nectary 5-lobed. Fruit of thin, paired follicles, somewhat divergent; seeds comose.

Ichnocarpus frutescens (L.) R. Br. in Aiton, Hort. Kew. ed. 2, 2: 69. 1811; Wight, Ic. t. 430. 1840-1843; Gamble, Fl. Madras 820(577). 1923. *Apocynum frutescens* L., Sp. Pl. 213. 1753.

Leaves lanceolate to ovate, 4-8 cm, glabrous to sparsely pubescent below; base acute; apex acute to acuminate. Corolla white or rose, 3-4 mm long; lobes pubescent along margins and at base, 6-7 mm long. Follicles 5-15 cm long.

Indomalaysia, Australia. Common in scrub. August-February. *CJS* 9061, 12753, 13238, 13936.

NERIUM Linnaeus

Erect woody shrubs. Leaves whorled, 3 per node. Cymes terminal, corymbose. Calyx with subulate basal glands within. Corolla funnelform; tube with rows of bristles below the filaments within, with deeply laciniate scales at the mouth; lobes obliquely rounded, imbricate to the right. Stamens inserted at the base of the widened part of the tube; filaments short; anthers connivent and somewhat adnate to the stigma, sagittate with sterile bases which hook inward at the tips; the tips of the connectives greatly extended, long pilose. Stigma slightly enlarged and collared, pubescent; ovaries separate, glabrous. Fruit of paired follicles, nearly parallel; seeds comose.

Nerium indicum Miller, Gard. Dict. ed. 8, n. 2. 1768; Sant., Fl. Khandala ed. 2, 150. 1967; *Nerium odorum* Solander in Aiton, Hort. Kew. ed. 1, 1: 297. 1789; Gamble, Fl. Madras 821(577). 1923.

Leaves linear-lanceolate, 10-20 cm long, sparsely pubescent when young, later glabrous, base and apex acute. Corolla red, white or occasionally yellow; tube 14-16 cm long; lobes obliquely rounded, about 15 mm long. Follicles 15-25 cm long.

Probably a native of the western *Himalayas* but now widely planted in the Asian tropics and as far north as Japan. Common in gardens. Like the similar European species, *N. oleander*, this plant is well known for its poisonous properties. December-March. *CJS* 12026, 12864.

Note: *N. indicum* and *N. oleander* are commonly treated as separate species. However, some are inclined to consider them conspecific (cf. Grant, Fosberg & Smith, *Smithsonian Contrib. Bot.* 17: 53. 1974).

PARSONSIA R. Brown *nom. cons.*

Woody, twining vine. Cymes terminal or lateral, corymbose to paniculate. Calyx with deltoid basal glands within. Corolla campanu-

late; tube puberulent on the outside and with a ring of bristles within; lobes linear-lanceolate, erect, imbricate to the right. Stamens inserted near the base of the tube; filaments tightly spiralled together around the style; anthers sagittate, with sterile bases, connivent around and adnate to the stigma. Stigma columnar, collared, glabrous; ovary single, bilobed, bilocular, glabrous; nectary of 5 free scales. Fruit of paired follicles (appearing to be single until separation at maturity); seeds comose.

Parsonsia laevigata (Moon) Alston, Ann. Roy. Bot. Gard. (Peradeniya) 11: 203. 1929. *Echites laevigata* Moon, Cat. Pl. Ceylon 20. 1824. *Parsonsia spiralis* Wall. ex. G. Don. Gen. Syst. 4: 80. 1837-1838; Wight, Ic. t. 1303. 1848; Gamble, Fl. Madras 814(572). 1923.

Leaves elliptic, 8-15 cm long, glabrous, base rounded to slightly cordate, apex acuminate. Corolla white; tube about 5 mm long; lobes about 5 mm long. Follicles 12-17 cm long.

Tropical Asia and Malaysia. Common in semi-evergreen forests of Ghats. March-August. *CJS* 14431, 15786.

PLUMERIA Linnaeus

Large shrub or small tree. Stems thick and fleshy above, woody below. Leaves alternate. Corymbs terminal. Calyx eglandular. Corolla salverform; tube pubescent within; lobes imbricate to the left. Stamens inserted near the base of the tube; filaments obsolete; anthers oblong-ovate, free. Stigma bilobed, glabrous; ovaries separate, glabrous; nectary absent or poorly developed. Fruit of paired linear-lanceolate follicles, widely divergent; seeds with a basal wing.

Plumeria rubra L., Sp. Pl. 209. 1753; Woodson, Ann. Missouri Bot. Gard. 25: 297. 1938. *Plumeria acuminata* R. Br. in Aiton, Hort. Kew. ed. 2, 2: 70. 1811. *Plumeria acutifolia* Poiret in Lam., Encycl. Suppl. 2. 667. 1812; Gamble, Fl. Madras 821(577). 1923.

Leaves oblong-lanceolate to obovate, mostly 20-40 cm long, glabrous to sparsely pubescent below, base acute, apex acute to acuminate. Corolla white, yellow, rose or combinations of these colors; tube 10-25 mm long; lobes broadly ovate, 25-60 mm long. Follicles 9-30 cm long.

Native to Tropical America but now cultivated throughout the tropics. Occasional; found naturalizing. January-April. *CJS* 12311. The milky sap is used in small doses as a purgative and in larger doses is poisonous.

* * *

Allamanda cathartica L. with large yellow flowers is an ornamental climber grown in gardens. *Thevetia peruviana* (Pers.) Schumann is chiefly grown near temples and villages.

109. ASCLEPIADACEAE

W. D. Stevens

Usually twining or straggling herbs or shrubs, sometimes succulent, usually with milky sap. Leaves opposite, simple, sometimes absent, estipulate, entire, reticulate-veined. Flowers bisexual, 5-merous, actinomorphic, gamosepalous and gamopetalous, in terminal or lateral umbels or umbellate, corymbose, or paniculate cymes. Stamens either connivent by the anthers (Periplocoideae) or completely connate and adnate to the style apex forming a gynostegium (Asclepiadoideae). Sometimes with a corolline corona elaborated from the corolla tube and typically with a staminal, or true, corona elaborated from the filaments or connectives. Pollen of the Periplocoideae in tetrads and falling onto spatulate pollen carriers which are equipped with an adhesive disc and which are formed on the surface of the style apex between the anthers. Pollen of the Asclepiadoideae in 1 or 2 waxy masses (pollinia) per anther locule; the pollinia of adjacent locules of adjacent anthers connected by arms to more or less horny corpuscula. Gynoecium of 2 superior unilocular carpels united only by the enlarged style apex. Fruit of paired or single (by abortion of 1) follicles. Seeds flattened, comose.

1 Plants erect.
2 Leaves reduced and caducous; stems angular and succulent.....**Caralluma**
2 Leaves well developed; stems terete, not succulent.
3 Plants less than 50 cm tall; sap watery.
4 Leaves ovate; roots fascicled; corolla rotate.....**Tylophora**
4 Leaves lanceolate to linear; rootstock tuberous; corolla tubular.....**Ceropegia**
3 Plants more than 50 cm tall; sap milky.
5 Large woody shrub, mostly 1-3 m tall; leaves ovate to obovate, sessile..**Calotropis**
5 Smaller herb, mostly less than 1 m tall; leaves lanceolate, petiolate....**Asclepias**
1 Plants twining, procumbent, or straggling.
6 Leaves absent or reduced and caducous.
7 Stems twining; corolla tubular.....**Ceropegia**
7 Stems straggling; corolla rotate.....**Sarcostemma**
6 Leaves well developed.
8 Corolla more than 20 mm long, tubular.....**Ceropegia**
8 Corolla less than 20 mm long, rotate.
9 Corolla entirely glabrous.
10 Corona cupular, enclosing the gynostegium; often with small rounded stipule-like axillary leaves.....**Cynanchum**
10 Corona, if present, not cupular; without such axillary leaves.
11 Corona of 5 lobes.

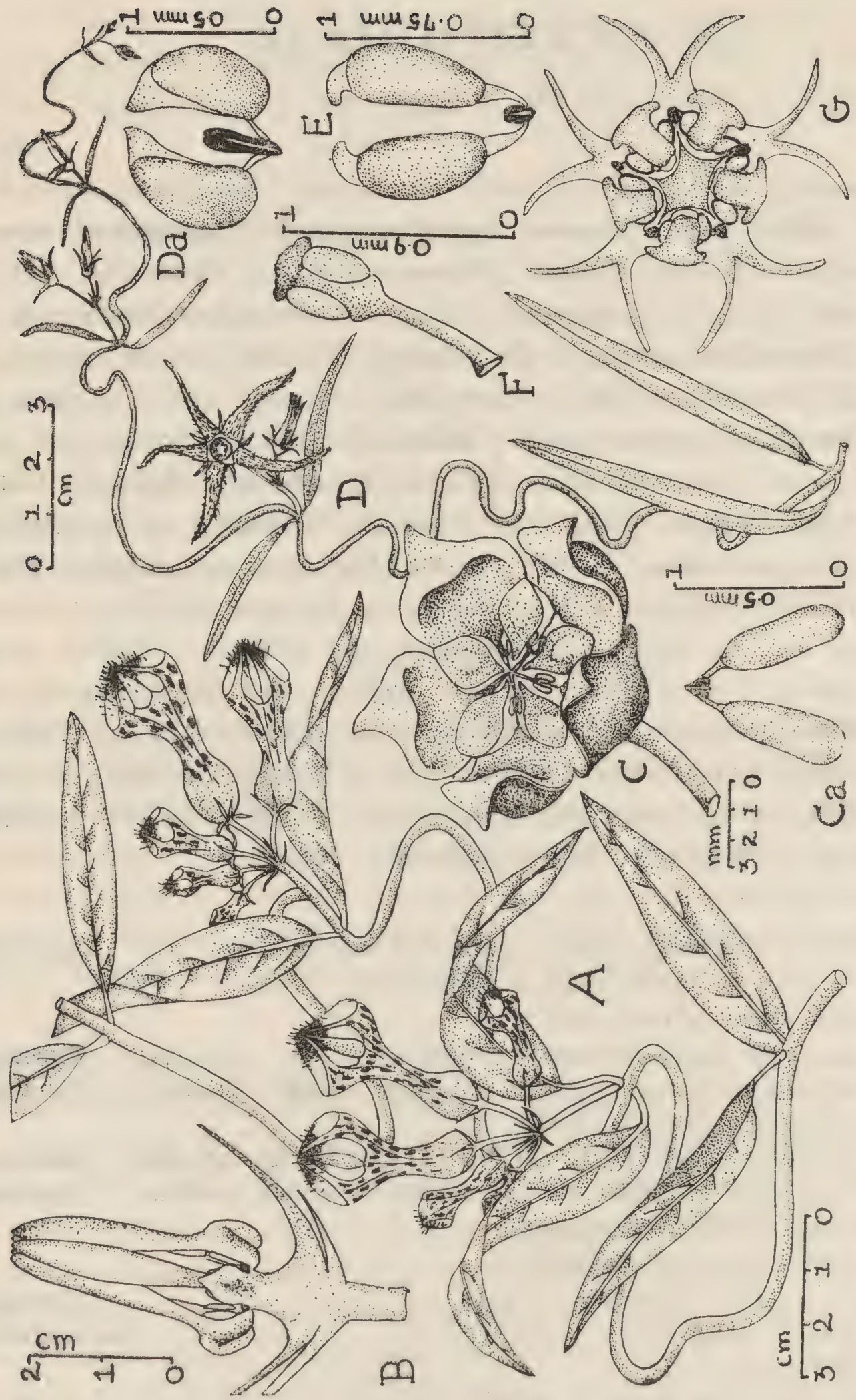


Fig. 87. ASCLEPIADACEAE. *A. Ceropegia juncea*: corona with gynostegium. *B. Ceropegia elegans*: flowering plant. *C. Hoya wightii*: flower; *Ca*, pollinia. *D. Brachystelma volubile*: flowering branch; *Da*, pollinia. *E. Leptadenia reticulata*: pollinia. *F. Hemidesmus indicus*: pollen carrier. *G. Caralluma adscendens*: gynostegium with corona, top view.

12 Leaf bases rounded to cordate; style apex not exserted.
13 Corona lobes entire, adnate to staminal column.....**Tylophora**
13 Corona lobes bifid, adnate to staminal column at base, free above.....**Cosmostigma**
12 Leaf bases acute; style apex exserted from the gynostegium.
14 Leaves lanceolate, glabrous; style apex capitate.....**Secamone**
14 Leaves elliptic to obovate, rusty-tomentose; style apex fusiform.....**Toxocarpus**
11 Corona unlobed or absent.
15 Corona of a prominent fleshy annulus at the base of the gynostegium; anthers completely connate.....**Holostemma**
15 Corona absent; filaments free.
16 Corolla 4-5 mm long, lobes valvate.....**Hemidesmus**
16 Corolla 10-14 mm long, lobes strongly imbricate.....**Cryptolepis**
9 Corolla pubescent, at least within or on the margins.
17 Stamens connate only by the anthers; corolla densely white-villous within.....**Decalepis**
17 Stamens more completely connate.
18 Corolla with fleshy lobes within at the sinuses.
19 Corolla lobes valvate, margins revolute at anthesis.....**Leptadenia**
19 Corolla lobes imbricate, margins not revolute at anthesis.....**Gymnema**
18 Corolla without such lobes.
20 Corona of 2 series of lobes, the outer membranous; leaf bases deeply cordate; stem hispid.....**Pergularia**
20 Corona of a single series of lobes.
21 Flowers solitary or in umbels; plants primarily epiphytic with thick, waxy, glabrous leaves.....**Hoya**
21 Flowers in cymes (sometimes umbellate cymes); plants not epiphytic.
22 Corolla lobes densely white-villous within.
23 Leaves broadly ovate, cordate; pollinia 4 per anther.....**Genianthus**
23 Leaves linear; pollinia 2 per anther.....**Brachystelma**
22 Corolla lobes not white-villous within; pollinia 2 per anther.
24 Corolla lobes valvate; corona lobes large, fleshy.....**Wattakaka**
24 Corolla lobes imbricate; corona lobes small, tuberculate.....**Tylophora**

ASCLEPIAS Linnaeus

Plants erect, herbaceous or somewhat woody below. Cymes umbellate, lateral. Corolla reflex-rotate; lobes imbricate to the right, glabrous. Corona of 5 stipitate, tubular lobes (hoods) attached to the top of gynostegium stipe; an acicular structure (horn) which arches over the gynostegium arises from within each of the hoods. Gynostegium long-stipitate. Pollinia pendent from dark horny corpuscula, 2 per anther, waxy, without a pellucid margin.

Asclepias curassavica L., Sp. Pl. 215. 1753; Gamble, Fl. Madras 833(585). 1923.

Leaves lanceolate, glabrous except when young, 5-15 cm long; base acute; apex acute to acuminate. Corona lobes 5-10 mm long, bright orange.

A native of Tropical America. This weedy species has spread throughout the humid tropics. Common along roadsides in Ghats. All seasons. *CJS* 12193, 13328, *Stevens* 520.

BRACHYSTELMA R. Brown

Erect or twining herbs with an underground tuber. Leaves narrowly linear. Inflorescence of lateral, peduncled cymes or flower solitary. Corolla campanulate to rotate; lobes sometimes adherent by tips, valvate or sometimes overlapping to right, usually softly pubescent; corona adherent on staminal tube, annular or toothed. Staminal column short; pollinia 2 per anther, pellucid on the inside near apex. Style apex flat.

Brachystelma volubile J. Hooker, Fl. Brit. India 4: 65. 1883; Gamble, Fl. Madras 852(599). 1923.

Twining perennials. Leaves to 10 cm long. Calyx lobes linear, acuminate. Corolla lobes ovate-lanceolate, acute, pink with white hairs. Corona entire.

Deccan. Occasional at Nagpuri amongst grasses in dry regions. August-September. *CJS* 17894, *HFP* 1963.

CALOTROPIS R. Brown

Shrubs. Cymes subumbellate, lateral. Corolla rotate; lobes slightly imbricate to the right, glabrous. Corona of 5 keel-shaped lobes adnate to the gynostegium, each with a recurved vesicle at the base and a pair of auricles at the apex. Gynostegium elongate but not strictly stipitate. Pollinia pendent from dark horny corpuscula, 2 per anther, waxy, without pellucid margins.

Calotropis gigantea (L.) R. Br. in Aiton, Hort. Kew. ed. 2, 2: 78. 1811; Gamble, Fl. Madras 832(585). 1923. *Asclepias gigantea* L., Sp. Pl. 214. 1753.

Leaves elliptic-ovate to obovate, densely arachnoid pubescent when young, later glabrous, 10-20 cm long; base clasping-cordate; apex obtuse or slightly acuminate. Corolla lobes 5-20 mm long, purple to white.

Throughout much of Tropical Asia. A common weed in disturbed areas around habitation. December-May. *CJS* 12075, 13383.

Note: Parts of this plant are put to many local uses. The stems are a source of bast fiber, the seed comas are used for stuffing and the highly toxic sap is used for a variety of medicinal purposes. The species has a number of rather specific insect predators and would be an excellent subject for the study of evolutionary and population biology. It is pollinated, probably exclusively, by carpenter bees (*Xylocopa*).

CARALLUMA R. Brown

Succulent herbs with erect quadrangular stems and clear viscous sap. Leaves much reduced, caducous. Umbels terminal or flowers lateral and solitary. Corolla rotate to campanulate, with valvate aestivation. Outer corona 10-lobed; inner corona 5-lobed; each lobe strap-shaped and inflexed over the gynostegium. Gynostegium short, sessile. Pollinia erect from dark horny corpuscula, 2 per anther, waxy, with pellucid margins.

Note: These species are pollinated by small, probably scatophagous, dipterans and perhaps also by small beetles.

1 Inflorescence a many-flowered terminal umbel; corolla lobes connate for more than half their length ..... *C. umbellata*
1 Flowers borne singly and laterally; corolla lobes free for most of their length.
2 Corolla lobes folded back along the midrib, pilose or glabrous, with some yellow markings ..... *C. adscendens*
2 Corolla lobes not folded, at anthesis with a few large spindle-shaped hairs on the margin (easily lost), otherwise glabrous, without yellow markings ..... *C. stalagmifera*

Caralluma adscendens Haworth, Syn. Pl. Succ. 47. 1812; Gamble, Fl. Madras 861(605). 1923. Gravely & Mayurnathan, Bull. Madras Govt. Mus. 4: 8. 1931. *Stapelia adscendens* Roxb., Pl. Cor. t. 30. 1795. *Caralluma fimbriata* Wall., Pl. As. Rar. 1: 7. 1829. *Caralluma attenuata* Wight, Ic. t. 1268. 1848.

Stems 20-100 cm tall. Flowers mostly single on upper stems; pedicels less than 1 cm long. Calyx glabrous. Corolla campanulate; lobes free for most of their length, linear-deltoid, the distal 2/3 folded back along the midrib, apiculate; pubescence variable, densely pilose to glabrous; color variable, deep purple-brown and yellow in various patterns. Outer corona lobes meeting and arching apart as long thin horns.

Peninsular India, Sri Lanka, Burma. Common in scrub. May-January. *CJS* 13535, *Stevens* 401, 578. This species and the next are eaten uncooked in some areas.

Note: A variable species that may actually involve several entities. Gravely & Mayurnathan recognized 6 varieties of this species, 2 or 3 of which are represented in the District. The difficulty of determination, however, makes their inclusion unwarranted.

Caralluma stalagmifera Fischer, Bull. Misc. Inform. 430. 1925; Gravely & Mayurnathan, Bull. Madras Govt. Mus. 4: 16. 1931.

Stems less than 40 cm tall. Flowers single on upper stems; pedicels less than 1 cm long. Calyx glabrous. Corolla rotate to campanulate, lobes free for most of their length, deltoid, not folded, apiculate. Fresh flowers with a few very large reddish-purple spindle-shaped hairs hanging

pendently along the distal margin, these easily detached; color deep purple-brown except for a thin white ring at the base. Outer corona lobes meeting and arching upward as long thin horns.

Peninsular India. Occasional in open scrub. May-January. *CJS* 14502, *Stevens* 398, 576.

Caralluma umbellata Haworth, Syn. Pl. Succ. 47. 1812; Gamble, Fl. Madras 861(605). 1923; Gravely & Mayurnathan, Bull. Madras Govt. Mus. 4: 23. 1931. *Boucerosia umbellata* (Haworth) Wight & Arn. in Wight, Contrib. Ind. Bot. 34. 1834; Wight, Ic. t. 495. 1840-1843. *Boucerosia lasiantha* Wight, Ic. t. 1286. 1848; *Boucerosia campanulata* Wight, Ic. t. 1287. 1848. *Caralluma lasiantha* (Wight) N. E. Brown, Gard. Chron. 12: 369. 1892; Gamble, Fl. Madras 861 (606). 1923.

Stems 20-30 cm tall, thick. Umbel many-flowered, terminal. Pedicels mostly 1-2 cm long. Calyx lobes mostly somewhat pubescent distally. Corolla rotate to campanulate, size variable but lobes broad and connate for more than half their length, not folded or apiculate; pubescence variable, long pilose to glabrous; color variable, with deep purple markings over a yellow background. Outer corona lobes erect, deltoid.

India, Sri Lanka. Fairly common in dry rocky areas. March-August. *CJS* 12874, 13536. *Stevens* 475. Often forming large circular patches among the rocks. A variable species throughout its range but represented in the District by the most typical forms.

CEROPEGIA Linnaeus

Sometimes erect herbs with watery sap. Cymes subumbellate, lateral. Corolla tubular, lobes valvate. Corona of 2 series of lobes, the outer sometimes deeply bifid, the inner entire. Gynostegium stipitate or sessile. Pollinia erect from dark horny corpuscula, 2 per anther, waxy, with pellucid margins.

Note: This genus has evolved a trap mechanism for pollination by small dipterans. The mouth of the tubular corolla is typically equipped with long, often colored, hairs which move with the slightest breeze, and these combined with the corolla color (purples, whites and yellows) serve to attract the dipterans to the flowers. The neck of the corolla has retrorse hairs or is quite smooth, preventing the insects from easily escaping the flower after entering. The insects are trapped in the inflated base of the corolla, which is often lighted by translucent areas on the sides (probably keeping the insects active), and pollinia become attached to them to be transferred to other flowers upon escape. Escape is facilitated during the last stage of anthesis by the corolla turning downward and the hairs in the neck becoming flaccid.

The fleshy underground parts of most of these species are eaten by animals, apparently wild boars in the District, and this probably accounts for the scarcity of these attractive plants. A number of other species in this genus may eventually be found in the District.

1 Leaves poorly developed or absent; stems fleshy.....*C. juncea*
1 Leaves well developed; stems not fleshy.
2 Stems erect; leaves all linear or narrowly lanceolate.
3 Stems and leaves glabrous; corolla lobes pilose for most of their length....*C. spiralis*
3 Stems and upper surface of leaves minutely puberulent, especially when young; corolla lobes pilose only at the base, glabrous above.....*C. fimbriifera*
2 Stems twining; linear leaves, if present, on upper stem only.
4 Plants densely pilose, especially on the stems and peduncles; inner corona lobes hooked.....*C. hirsuta*
4 Plants sparsely pubescent or glabrous; inner corona lobes not hooked.
5 Leaves fleshy.....*C. bulbosa*
5 Leaves membranous or subcoriaceous.
6 Corolla funnel-shaped.....*C. elegans*
6 Corolla not funnel-shaped.
7 Crown of corolla lobes forming short, blunt beak.....*C. candelabrum*
7 Crown of corolla lobes drawn out.....*C. tuberosa*

Ceropegia bulbosa Roxb., Pl. Cor. t. 7. 1795; Wight, Ic. t. 845. 1844-1845; Gamble, Fl. Madras 857(602). 1923; Huber, Mem. Soc. Brot. 12: 60. 1957.

Rhizome tuberous; stem trailing. Leaves ovate, glabrous, 3-6 cm long, slightly cordate, fleshy. Cymes 3-5-flowered. Corolla about 2.5 cm long, whitish-green, purple striate; lobes narrow, short, densely purple pilose. Outer corona lobes rounded to shortly acute, glabrous, equaling the gynostegium; inner lobes straight, clavate.

India. Occasional along roadsides in middle Shiradi Ghat. October. *HFP* 2898.

Ceropegia candelabrum L., Sp. Pl. 211. 1753; Gamble, Fl. Madras 857(602). 1923; Huber, Mem. Soc. Brot. 12: 58. 1957, *pro parte.*

Rhizome tuberous; stem twining. Leaves usually elliptic, glabrous, slightly apiculate. Corolla swollen at base; crown narrower, ending in a short, brownish-purple beak. Follicles to 10 cm, narrowly attenuate.

S. India. Occasional in wet deciduous forests at Vanagur. October. *CJS* 18806, *HFP* 2304.

Ceropegia elegans Wall., Bot. Mag. 57: t. 3015. 1830; Gamble, Fl. Madras 857(602). 1923; Huber, Mem. Soc. Brot. 12: 72. 1957; Wight, Ic. t. 1265. 1848. *Ceropegia mysorensis* Wight, Ic. t. 846. 1844-1845; Gamble, Fl. Madras 857(602). 1923. *Ceropegia walkerae* Wight, Ic. t. 1266. 1848; Gamble, Fl. Madras 857(602). 1923.

Rhizome not tuberous, stem twining. Leaves elliptic, glabrous or slightly puberulent, 3-12 cm long, base rounded, apex slightly acuminate. Cymes mostly 2-4-flowered. Corolla 2-4 cm long, dark purple; mouth widely dilated; lobes broad and folded back upon themselves, long purple-ciliate on the margins. Outer corona lobes deeply bifid, pilose

on the margins, extending above the gynostegium; inner lobes linear, less than 2 times the length of the outer. Gynostegium sessile.

Southern Peninsular India, Sri Lanka. Fairly common in Bisle Ghat. September-March. *CJS* 15620, *Stevens* 415.

Ceropegia fimbriifera Bedd., Madras J. Lit. Sci. ser. 2, 6: 53. 1861; Huber, Mem. Soc. Brot. 12: 127. 1957.

Rhizome tuberous, stem erect. Leaves linear to narrowly lanceolate, puberulent above, 5-15 cm long; base and apex acute. Cymes 1-4-flowered. Corolla 3-4.5 cm long, greenish-white outside and purple-striate inside; mouth slightly dilated; lobes linear, densely long purple-pilose within at the base, glabrous above. Outer corona lobes bifid, ciliate; inner lobes linear. Gynostegium sessile.

Southern Peninsular India. One plant collected at Vanagur. October. *CJS* 15532.

Ceropegia hirsuta Wight & Arn. in Wight, Contrib. Ind. Bot. 30. 1834; Gamble, Fl. Madras 859(604). 1923; Huber, Mem. Soc. Brot. 12: 63. 1957.

Rhizome tuberous, stem twining. Leaves variable, mostly ovate-elliptic with a rounded base, pilose; apex acute to obtuse. Cymes few-flowered. Corolla 3-5 cm long, light green and variously splotched and striped with purple, upper 1/3 of lobes light yellow; mouth dilated; lobes broad and folded back upon themselves, ciliate on the margins and midrib. Outer corona lobes deltoid with cleft apex, long pilose, extending above the gynostegium; inner lobes linear and hooked at the tips, 3 times the length of the outer. Gynostegium short-stipitate.

Southern Gangetic Plain southward to Karnataka. Locally common in western plain and dry deciduous forests. July-October. *CJS* 9237, 14686, 14687. (Frontispiece).

Ceropegia juncea Roxb., Pl. Cor. t. 10. 1795; Wight, Ic. t. 1260. 1848; Gamble, Fl. Madras 856(602). 1923; Huber, Mem. Soc. Brot. 12: 86. 1953.

Rhizome not thickened, stem twining. Leaves reduced or usually absent. Cymes 2-5-flowered. Corolla 3-6 cm long, light whitish-green with purple spots; mouth dilated; lobes narrow and folded back upon themselves, the lower 2/3 of the midrib pilose, the upper 1/3 with long, purple, clavate hairs. Outer corona lobes deltoid with cleft apex, pilose, extending slightly above the gynostegium, inner lobes narrowly linear and hooked at the tips, about 5 times the length of the outer. Gynostegium sessile.

Peninsular India. Occasional in scrub. December-August. *CJS* 11993, 13752.

Ceropegia spiralis Wight, Ic. t. 1267. 1848; Gamble, Fl. Madras 856(602). 1923; Huber, Mem. Soc. Brot. 12: 127. 1957.

Rhizome tuberous; stem erect. Leaves narrowly linear, glabrous, 10-20 cm long, base and apex acute. Cymes mostly single flowered. Corolla 4-6 cm long, greenish-purple below and purple above; mouth slightly dilated; lobes linear to ovate, purple-pilose within nearly to the apex. Outer corona lobes entire to slightly bifid, glabrous, inner lobes linear. Gynostegium sessile.

Southern Peninsular India. Fairly common in Nagpuri hills. August-September. *CJS* 17893, *HFP* 1965.

Ceropegia tuberosa Roxb., Pl. Cor. t. 9. 1795; Gamble, Fl. Madras 857 (603). 1923; *Ceropegia candelabrum* auct. non L., 1753; Huber, Mem. Soc. Brot. 12: 58. 1957, *pro parte*.

Rhizome tuberous; stem twining. Leaves ovate to lanceolate, sparsely hispid, 3-7 cm long, base acute to slightly cordate, apex acuminate to mucronate. Cymes mostly 5-15-flowered. Corolla 2-4 cm long, whitish-green, purple-striate; mouth slightly dilated; lobes narrow, densely purple-pilose. Outer corona lobes broadly rounded, pilose, about equaling the gynostegium, inner lobes spatulate, about 3 times the length of the outer. Gynostegium stipitate.

Central & Southern Peninsular India, Sri Lanka. Occasional in scrub in eastern plains. June-October. *CJS* 14103, *Stevens* 773.

Note: Huber (*l.c.*) has reduced *C. tuberosa* Roxb. to *C. candelabrum* L. The two species are, however, quite distinct especially with regard to the corolla lobes. The crown of the corolla lobes is shortly beaked in the latter and elongate-spatulate in the former.

COSMOSTIGMA Wight

Leaves cordate. Inflorescence of dense racemes, lateral. Corolla rotate, imbricate to right, stellately patent; corona usually bilobed, adnate to staminal column. Filaments shortly connate; pollinia 2 per anther, erect, without pellucid margins. Style apex flat.

Cosmostigma racemosum (Roxb.) Wight, Contrib. Ind. Bot. 42. 1834; Gamble, Fl. Madras 846(595). 1923. *Asclepias racemosa* Roxb., Fl. Ind. 2: 32. 1832.

Leaves 5-14×4-8 cm, broadly ovate, acute to acuminate. Corolla greenish-yellow with brown dots. Corona lobes bifid.

India, Sri Lanka, Java. Occasional in upper Ghats in thickets. June. *HFP* 2854.

CRYPTOLEPIS R. Brown

Cymes lateral, paniculate. Corolla campanulate; lobes strongly

imbricate to the right, with glabrous, a coralline corona of a blunt fleshy lobe from each sinus. Staminal corona absent. Filaments free, broad; anthers sagittate, connivent over the style apex. Pollen carriers narrow; pollen granular.

Cryptolepis buchananii Roemer & Schultes, Syst. Veg. 4: 409. 1819; Wight, Ic. t. 494. 1840; Gamble, Fl. Madras 826(580). 1923.

Leaves elliptic, glabrous, 8-16 cm long, apiculate to caudate. Corolla 10-14 mm long, pale greenish-yellow.

Peninsular India, Sri Lanka. Occasional in moderately disturbed areas. April-August. *CJS* 9506, 13503, 14521.

CYNANCHUM Linnaeus

Cymes lateral, often subumbellate. Corolla rotate; lobes imbricate to the right, glabrous. Corona attached to the base of the gynostegium, white, cupular. Gynostegium short-stipitate. Pollinia pendent from dark horny corpuscula, 2 per anther, waxy, without pellucid margins.

Note: A nearly cosmopolitan genus of perhaps 150 species, nomenclaturally and taxonomically difficult and very much in need of study.

1 Leaves sagittate with rounded lobes; cordate base with a broad sinus; major corona lobes acute, contorted.....*C. tunicatum*

1 Leaves linear-oblong; cordate base with a narrow sinus; major corona lobes obtuse and bifid, erect.....*C. callialata*

Cynanchum callialata Hamilton ex Wight, Contrib. Ind. Bot. 56. 1834; Wight, Ic. t. 1279. 1848; Gamble, Fl. Madras 836(588). 1923.

Leaves linear-oblong, sparsely pubescent on margin and petiole, otherwise glabrous, whitish beneath, to 8 cm long, base cordate with a narrow sinus, apex short-acuminate, margins slightly undulate. Peduncles sparsely pubescent; pedicels puberulent. Calyx lobes glabrous. Corolla lobes 5 mm long, pale greenish-brown. Corona somewhat plicate, with 5 erect, obtuse, bifid lobes alternating with 1-several small lobes or teeth. Follicles winged.

Burma to S. India. Occasional in lower Ghats. October-December. *CJS* 15870, *HFP* 857.

Cynanchum tunicatum (Retz.) Alston in Trimen, Handb. Fl. Ceylon b: 194. 1931; Sant. & Irani, Bot. Mem. Univ. Bombay No. 4, 40. 1962. *Periploca tunicata* Retz., Obs. Bot. 2: 15. 1781. *Cynanchum pauciflorum* R. Br., Mem. Wern. Nat. Hist. Soc. 1: 45. 1810; Wight, Ic. t. 354. 1840; Gamble, Fl. Madras 836(587). 1923.

Leaves sagittate with rounded lobes, sparsely pubescent, somewhat

lighter green below, to 8 cm long; base cordate with a broad sinus; apex acute to short-acuminate; margins undulate. Inflorescence glabrous or sparsely pubescent. Calyx lobes ciliate on margins. Corolla lobes about 4 mm long, greenish-brown. Corona plicate, with 5 long, acute, contorted lobes alternating with 5 shorter lobes. Follicles without wings.

South W. India, Sri Lanka. Collected only along Shiradi Ghat road near the District border. October. *CJS* 15318.

DECALEPIS Wight & Arnott

Cymes lateral to subterminal, paniculate. Corolla lobes imbricate to the right, densely white-villous within. Corona of 2 series of lobes, the outer series of 5 broad bifid scales basally adnate to the back of the filaments, the inner series of 5 truncate lobes forming an open ring around the ovaries. Filaments free, anthers connivent around the style apex. Pollen carriers broad and bluntly shovel-shaped; pollen granular.

Decalepis hamiltonii Wight & Arn. in Wight, Contrib. Ind. Bot. 64. 1834; Wight, Ic. t. 1285. 1848; Gamble, Fl. Madras 828(582). 1923.

Leaves glabrous, obovate-orbicular, 5-10 cm long, obtuse-emarginate. Corolla lobes 4-5 mm long, pale brown outside.

S. Peninsular India. Found only in rocky places in Nagpuri hills. April-September. *CJS* 13840, 14128.

GENIANTHUS J. Hooker

Cymes lateral, paniculate. Corolla campanulate; lobes valvate or slightly imbricate to the left at the apex, densely white-villous within. Corona of 5 adnate scales with terminal adnate projections reaching nearly to the top of gynostegium and short free cusps on the backs. Gynostegium sessile; style apex dome-shaped, not exserted. Pollinia sessile on light colored, slightly horny corpuscula, 4 per anther, waxy, without pellucid margins.

Genianthus laurifolius (Roxb.) J. Hooker, Fl. Brit. India 4: 16. 1883; Gamble, Fl. Madras 831(584). 1923. *Asclepias laurifolia* Roxb., Fl. Ind. 2: 49. 1832. *Toxocarpus laurifolius* (Roxb.) Wight, Contrib. Ind. Bot. 61. 1834; Wight, Ic. t. 598. 1840-1843.

Leaves broadly elliptic, glabrous, 6-10 cm long, acuminate. Corolla to 2 mm long.

West-Central Peninsular, North Eastern India. Collected once in Shiradi Ghat. November-December. *CJS* 11469.

Note: It has been mentioned in the literature (e.g. Gamble, *l.c.*) that dimorphic flowers occur on this plant. Santapau and Irani (*Bot. Mem. Univ. Bombay* No. 4, 46. 1962) failed to find these on the plants they examined and neither were these observed in Hassan plants. Immature buds tend to open on drying and this is perhaps the basis of the original observation.

GYMNEMA R. Brown

Cymes corymbose, lateral. Corolla campanulate; lobes valvate or slightly imbricate to the right; corolline corona of a fleshy projection from each sinus which is incumbent upon the exserted style apex; each projection with a decurrent base flanked by 2 rows of short stiff hairs, with ciliolate margins. Gynostegium elongate, without a corona. Pollinia erect from dark horny corpuscula, 2 per anther, waxy, without pellucid margins.

Gymnema sylvestre (Retz.) R. Br. ex Schultes, Syst. Veg. ed. 15, 6: 57. 1820; Gamble, Fl. Madras 839(590). 1923; Wight, Ic. t. 349. 1840. *Periploca sylvestris* Retz., Obs. Bot. 2: 15. 1781.

Leaves ovate to oblong, sparsely to densely pubescent, 4-6 cm long, base rounded to cordate, apex short acuminate. Corolla lobes 2-4 mm long, pale yellow.

Tropical Africa, Asia, Malaysia. Common in all but the wettest areas. All seasons. *CJS* 10687, *Stevens* 403, 455.

Note: Chewing the leaves of this plant makes one temporarily unable to taste sugar and consequently it has been fancied by some as a treatment for diabetes.

HEMIDESMUS R. Brown

Cymes lateral, subsessile. Corolla rotate; lobes valvate, glabrous; corolline corona of 5 fleshy lobes from below the sinuses. Staminal corona absent. Filaments free; anthers connivent by their tips over style apex. Pollen carriers obconical, doubled; pollen granular but usually adhering into masses (4 per anther).

Hemidesmus indicus (L.) R. Br. in Aiton, Hort. Kew. ed. 2, 2: 75. 1811; Wight, Ic. t. 594. 1842; Gamble, Fl. Madras 825(580). 1923. *Periploca indica* L., Sp. Pl. 211. 1753.

Leaves glabrous, variable, mostly elliptic-linear, 5-10 cm long, mostly apiculate. Corolla lobes 4-5 mm long, yellow to nearly brown.

Peninsular India, Sri Lanka. Common in all but the wettest parts of the District. July-January. *CJS* 9084, *Stevens* 490, 761.

HOLOSTEMMA R. Brown

Cymes lateral. Corolla rotate; lobes imbricate to the right, glabrous.

Corona a fleshy unlobed ring at the base of the gynostegium. Gynostegium sessile elongate. Pollinia pendent from dark horny corpuscula, 2 per anther, waxy, without pellucid margins.

Holostemma annulare (Roxb.) K. Schumann in Engl. & Prantl, Pflanzenfam. 4(2): 250. 1895; Gamble, Fl. Madras 834(586). 1923. *Asclepias annularis* Roxb., Hort. Beng. 20. 1814 ('*annularia*'). *Holostemma rheedei* Wall., Pl. As. Rar. 2: 51. 1831; Wight, Ic. t. 597. 1840-1843.

Leaves ovate, glabrous or sparsely pubescent, to 15 cm long; base cordate with a broad sinus; apex short acuminate. Corolla lobes 7-15 mm long, deep red-purple in the center, whitish on the upper margins and below.

Eastern Burma through India, Sri Lanka. Collected only in Nagpuri hills. June-July. *CJS* 13833, 13955. The fleshy flower buds are said to be eaten as vegetables.

HOYA R. Brown

Usually epiphytic, rooting at the nodes. Flowers lateral, solitary or in umbels. Corolla rotate; lobes valvate. Corona of 5 fleshy truncate lobes, with the outer margins stellately spreading, the upper surfaces concave, and the inner margins with cusps incumbent upon the gynostegium. Gynostegium short, sessile. Pollinia erect from dark horny corpuscula, 2 per anther, waxy, without pellucid margins.

1 Leaves linear-oblanceolate, apex retuse; flowers solitary.....*H. retusa*
1 Leaves elliptic, apex not retuse; flowers in umbels.
2 Leaf apices acuminate, margins revolute and not undulate, lateral veins at nearly right angles to the midrib.....*H. wightii*
2 Leaf not or only very slightly acuminate.
3 Peduncles as long as or shorter than petioles, 1-2-flowered.....*H. pauciflora*
3 Peduncles 5-6 times longer than petioles, many-flowered.....*H. ovalifolia*

Hoya ovalifolia Wight & Arn. in Wight, Contrib. Ind. Bot. 37. 1834; Wight, Ic. t. 847. 1844-1845; Gamble, Fl. Madras 848(597). 1923.

Leaves elliptic, glabrous, 5-7 cm long; base acute to slightly obtuse; apex acute to obtuse or very slightly acuminate; margins undulate and not revolute; lateral veins oblique (about 45°). Flowers in umbels. Petals 5-6 mm long, puberulent within, cream-colored.

Peninsular India, Sri Lanka. Fairly common in upper Ghats. December-January. *CJS* 12622, *Stevens* 501.

Hoya pauciflora Wight, Ic. t. 1269. 1848; Gamble, Fl. Madras 849 (597). 1923.

Leaves ovate, to 2-2.5 cm long; base rounded; apex acute to rounded; lateral veins indistinct. Flowers 1-2. Corolla lobes 7 mm long, glabrous, white.

South W. India, Sri Lanka. Rare. Collected twice in flower at Hullahalli. August-September. *HFP* 477, 643.

Hoya retusa Dalzell, Hooker's J. Bot. Kew Gard. Misc. 4: 294. 1852; Gamble, Fl. Madras 849(597). 1923.

Leaves linear-oblanceolate, glabrous, 3-4.5 cm long; base acute; apex retuse; margins neither revolute nor undulate; lateral veins obscure. Flowers solitary. Corolla lobes 6-8 mm long; margins pubescent within, white.

Central Western Ghats. Collected only near Kempuhole Bridge in lower Shiradi Ghat. July-November. *CJS* 11629, 14794.

Hoya wightii J. Hooker, Fl. Brit. Ind. 4: 59. 1883; Gamble, Fl. Madras 849(597). 1923. *Hoya pendula* sensu auct. excl. basionym: Wight & Arn. in Wight, Contrib. Ind. Bot. 36. 1834.

Leaves elliptic, glabrous, 5-10 cm long; base acute to attenuate; apex acuminate; margins revolute and not undulate; lateral veins at nearly right angles to the midrib (75-90°). Flowers in umbels. Corolla lobes 7-9 mm long, puberulent within, cream-colored.

South W. India. Common in wet forests of Ghats. May-July. *CJS* 12453, *Stevens* 422.

LEPTADENIA R. Brown

Sap watery. Cymes umbellate, lateral. Corolla rotate to campanulate; lobes valvate, densely pubescent; margins revolute at anthesis, corolline corona of a fleshy bilobed protuberance at each sinus. Staminal corona of an inconspicuous undulating ring on the lower part of the stipitate gynostegium. Pollinia erect from dark, horny corpuscula, waxy, with pellucid curved appendages at the tips.

Leptadenia reticulata (Retz.) Wight & Arn. in Wight, Contrib. Ind. Bot. 47. 1834; Wight, Ic. t. 350. 1840; Gamble, Fl. Madras 850 (598). 1923; Bullock, Kew Bull. 10: 291. 1955. *Cynanchum reticulatum* Retz., Obs. Bot. 2: 15. 1781.

Leaves ovate to lanceolate, puberulent above and below, 4-12 cm long; base rounded to slightly cordate; apex acute to acuminate. Corolla lobes about 3 mm long, pale greenish-white.

Upper Gangetic Plain to Peninsular India, Sri Lanka, eastward to Burma, also Madagascar, Mauritius, Comoro Islands. Collected only at Belvathalli State Forest in the eastern plains. July-April. *CJS* 13216, 13978. Pollinated by small dipterans.

PERGULARIA Linnaeus

Cymes corymbose to racemose, lateral. Corolla campanulate; lobes

slightly imbricate to the right, with a wide pubescent margin above, otherwise glabrous. Corona with 2 series of lobes; the outer series of 5 membranous truncate flaps; the inner of 5 fleshy lobes; each provided with 2 spurs, one directed outward and downward and the other upward with the tip hooking over the gynostegium. Gynostegium elongate. Pollinia pendent from dark horny corpuscula, 2 per anther, waxy, with pellucid margins.

Pergularia daemia (Forskal) Chiov., Result. Sc. Miss. Sefan.-Paoli Somal. Ital. 1: 115. 1916; Sant. & Irani, Bot. Mem. Univ. Bombay No. 4, 39. 1962. *Asclepias daemia* Forskal, Fl. Aegpt.-Arab. 51. 1775. *Cynanchum extensum* N. Jacq., Misc. 2: 353. 1782. *Daemia extensa* (N. Jacq.) R. Br. in Aiton, Hort. Kew. ed. 2, 2: 76. 1811. *Pergularia extensa* (N. Jacq.) N. E. Brown in Thistleton-Dyer, Fl. Cap. 4: 758. 1908; Gamble, Fl. Madras 836(588). 1923.

Leaves ovate, sparsely hispid below, 5-15 cm long; base deeply cordate; apex acuminate. Corolla lobes 10-14 mm long, greenish-white.

Tropical Africa, Afghanistan to India, Sri Lanka. Fairly common in scrub in eastern plains. July-January. *CJS* 13976, 15187.

SARCOSTEMMA R. Brown *emend.* Holm

Leafless herbs, somewhat succulent. Cymes umbellate, terminal. Corolla campanulate; lobes slightly imbricate to the right, glabrous, pale yellowish-white. Corona of 2 series of lobes, the outer short, cupular. Gynostegium sessile. Pollinia pendent from dark horny corpuscula, 2 per anther, waxy, without pellucid margins.

1 Style apex elongate-conical, exceeding the inner corona lobes; outer corona lobes 10 .... *S. intermedium*

1 Style apex short-conical, not exceeding the inner corona lobes; outer corona lobes 5 .... *S. acidum*

Sarcostemma acidum (Roxb.) Voigt, Hort. Sub. Calc. 542. 1845; Sant. & Irani, Bot. Mem. Univ. Bombay No. 4, 76. 1962. *Asclepias acida* Roxb., Fl. Ind. 2: 31. 1832. *Sarcostemma brevistigma* Wight & Arn. in Wight, Contrib. Ind. Bot. 59. 1834; Wight, Ic. t. 595. 1840-1843; Gamble, Fl. Madras 838(589). 1923.

Corolla lobes 4-6 mm long, margins revolute. Outer corona 5-lobed; inner corona of 5 fleshy, erect lobes with apices strongly inflexed. Style apex short-conical, entire, not exserted.

Peninsular India. Found only in Nagpuri hills. July-January. *CJS* 14137.

Sarcostemma intermedium Decaisne in DC., Prodr. 8: 538. 1844; Wight, Ic. t. 1281. 1848; Gamble, Fl. Madras 838(589). 1923.

Corolla lobes 5-8 mm long, margins revolute. Outer corona 10-lobed, inner corona of 5 fleshy erect lobes with the apices slightly inflexed. Style apex elongate-conical, shallowly cleft, exserted.

Peninsular India. Locally abundant in scrub, often climbing on *Euphorbia antiquorum*. October-July. *CJS* 13543, 13841, 13982, 14235.

Note: These plants are thought to have been a major ingredient in the ancient Indian beverage "soma." The fragrant flowers are produced in abundance and attract a variety of insect pollinators.

SECAMONE R. Brown

Note: The present generic limits within the tribe Secamoneae are unsatisfactory. Speculations on a solution to the problem have ranged from redividing the group into four or more taxa using some new criteria to considering the tribe as a single genus. The resolution will depend on careful monographic treatment of the whole tribe over its entire range.

Cymes lateral, somewhat paniculate. Corolla rotate; lobes imbricate to the left, glabrous, with a corolline corona of protuberances inside the tube below the sinuses. Staminal corona of 5 laterally compressed adnate lobes, not much more conspicuous than the anther wings. Gynostegium sessile. Style apex exserted, capitate. Pollinia sessile on light colored, slightly horny corpuscula, 4 per anther, waxy, without pellucid margins.

Secamone emetica (Retz.) R. Br. ex Schultes, Syst. Veg. 6: 124. 1820; Gamble, Fl. Madras 2: 829(583). 1923. *Periploca emetica* Retz., Obs. Bot. 2: 14. 1781.

Leaves lanceolate, often slightly oblique, 4-7 cm long, glabrous; base and apex acute. Corolla lobes to 3 mm long.

Peninsular India, Sri Lanka. Common in scrub. July-January. *CJS* 10683, 13927, *Stevens* 774. The roots are purported to be a powerful emetic, hence the specific epithet. Pollinated by small dipterans.

TOXOCARPUS Wight & Arnott

Leaves sparsely to densely rusty tomentose. Cymes lateral, paniculate. Corolla campanulate, lobes imbricate to the left, glabrous. Corona of 5 adnate lobes, each with an erect, dorsal, subulate process. Gynostegium sessile; style apex long-exserted, fusiform. Pollinia sessile on light colored, slightly horny corpuscula, 4 per anther, waxy, without pellucid margins.

Toxocarpus kleinii Wight & Arn. in Wight, Contrib. Ind. Bot. 61. 1834; Wight, Ic. t. 886. 1844-1845; Gamble, Fl. Madras 830(584). 1923.

Leaves elliptic to obovate, 6-10 cm long; base acute with revolute margins; apex acuminate. Corolla lobes 6-7 mm long.

Peninsular India, Sri Lanka. Rare, collected only once in flower in Shiradi Ghat. March. *CJS* 13131.

TYLOPHORA R. Brown

Sometimes erect. Sap watery or milky. Cymes umbellate to paniculate, lateral or terminal. Corolla rotate; lobes imbricate to the right. Corona 5-lobed. Gynostegium stipitate to sessile. Pollinia horizontal to ascending, from somewhat darkened horny corpuscula, 2 per anther, waxy, without pellucid margins.

1 Stems erect; leaves 1-4 cm long..... *T. fasciculata*
1 Stems procumbent or twining; leaves 4-10 cm long.
2 Stems strictly procumbent; leaves rotund..... *T. rotundifolia*
2 Stems twining or sometimes trailing; leaves not rotund.
3 Pedicels pilose; corolla lobes pilose within; sap watery..... *T. indica*
3 Pedicels glabrous; corolla glabrous; sap milky.
4 Leaves pilose; calyx usually pilose; corolla 2-3 mm long; peduncles less than 3 mm long (to first flower)..... *T. dalzellii*
4 Leaves glabrous; calyx glabrous; corolla 2-5 mm long; peduncles more than 10 mm long.
5 Cymes laxly branching; corolla 2-2.5 mm long..... *T. tenuis*
5 Cymes not branching; corolla 4-5 mm long..... *T. pauciflora*

Tylophora dalzellii J. Hooker, Fl. Brit. India 4: 43. 1883; Sant. & Irani, Bot. Mem. Univ. Bombay No. 4, 87. 1962.

Sap milky. Leaves elliptic to lanceolate, pilose, 5-8 cm long; base rounded to slightly cordate; apex acute to acuminate. Cymes lateral, umbellate to paniculate, blooming over a long period; the axis becoming branched and apparently thickened from the crowded persistent bracts and pedicel scars; peduncles 1-3 mm long (to first flower), pilose; pedicels 1-2 cm long, glabrous. Calyx lobes subulate, reflexed at the tips, sparsely pilose to glabrous. Corolla lobes 2-3 mm long, glabrous, reddish-purple. Corona lobes flattened, cuneate, adnate to the gynostegium. Gynostegium stipitate.

Western Peninsular India. Occasional in wet areas in Ghats. April-June. *CJS* 13785, 13886, 13896.

Tylophora fasciculata Ham. ex Wight, Contrib. Ind. Bot. 50. 1834; Wight, Ic. t. 848. 1844-1845; Gamble, Fl. Madras 842(592). 1923.

Stems erect, with watery sap. Leaves ovate, pubescent on margins and veins, 1-4 cm long; base rounded to slightly cordate; apex acute to short-acuminate. Cymes lateral, umbellate to paniculate; peduncles 2-5 mm long, pubescent; pedicels 5-10 mm long, pubescent. Calyx lobes deltoid,

revolute at anthesis, sparsely pilose. Corolla lobes 2.5-3 mm long, pilose within, purplish-brown. Corona lobes rounded, laterally concave, with a short cusp appressed to the gynostegium. Gynostegium stipitate.

Central & S. India, Sri Lanka. Locally abundant in Nagpuri hills. June-October. *CJS* 13838, 13879, 13952.

Tylophora indica (N. Burman) Merrill, Philipp. J. Sci. Bot. 19: 373. 1921; Sant. & Irani, Bot. Mem. Univ. Bombay No. 4, 88. 1962. *Cynanchum indicum* N. Burman, Fl. Ind. 70. 1768. *Asclepias asthmatica* L. f., Suppl. 171. 1781. *Tylophora asthmatica* (L. f.) Wight & Arn. in Wight, Contrib. Ind. Bot. 51. 1834; Wight, Ic. t. 1277. 1848; Gamble, Fl. Madras 843(593). 1923.

Sap watery. Leaves elliptic to ovate, pilose to occasionally glabrous, 5-10 cm long; base rounded to cordate; apex acute to acuminate or apiculate. Cymes lateral, umbellate to paniculate, peduncles to 1-3 cm long, pilose; pedicels about 2 cm long, pilose. Calyx lobes subulate, spreading, pilose. Corolla lobes 4-6 mm long, pilose within, reddish-purple in center, yellowish on margins. Corona lobes intricate, with a wide adnate base and a narrow free apex arching against the gynostegium. Gynostegium slightly stipitate.

Indomalaysia. The most common asclepiad, especially in the dry areas. April-September. *CJS* 8771, 10602, *Stevens* 489, 577.

Note: The leaves of this plant contain significant amounts of two alkaloids and are reported to be effective in treating some types of asthma.

Tylophora pauciflora Wight & Arn. in Wight, Contrib. Ind. Bot. 49. 1834; Wight, Ic. t. 1274. 1848; Gamble, Fl. Madras 843(592). 1923.

Sap milky (?). Leaves linear-ovate, glabrous, 5-10 cm long; base rounded to slightly cordate; apex acute to acuminate. Cymes lateral; peduncles about 2 cm long, glabrous; pedicels 5-10 mm long, glabrous. Calyx lobes deltoid, spreading, glabrous. Corolla lobes 4-5 mm long, glabrous, pale purplish-brown. Corona lobes globose, with small apical cusps. Gynostegium sessile.

South Western Peninsular India. Common on Shiradi Ghat. October-February. *CJS* 15812, 15995.

Tylophora rotundifolia Ham. ex Wight, Contrib. Ind. Bot. 50. 1834; Sant. & Irani, Bot. Mem. Univ. Bombay No. 4, 86. 1962.

Stems procumbent, sap watery. Leaves rotund to broadly ovate, pilose on margins and veins below, 4-8 cm long; base rounded to slightly cordate; apex rounded to obtuse, occasionally mucronate or emarginate. Cymes terminal or lateral, umbellate to paniculate; peduncles 1-5 cm long, pilose; pedicels 2-5 cm long, pilose. Calyx lobes deltoid, spreading, pilose. Corolla lobes 3.5-4.5 mm long, glabrous, or puberulent within,

pale greenish-purple. Corona lobes fleshy, rounded, with short apical cusps appressed to the gynostegium. Gynostegium slightly stipitate.

Peninsular India. Locally common, especially near Byra. May-September. *CJS* 13439, *Stevens* 444, 601.

Tylophora tenuis Bl., Bijd. 1062. 1827. *Asclepias tenuissima* Roxb. [Hort. Beng. 20. 1814, *nom.*] Fl. Ind. 2: 41. 1832. *Tylophora carnosa* Wall. ex Wight, Contrib. Ind. Bot. 49. 1834; Wight Ic. t. 351. 1840. *Tylophora tenuissima* (Roxb.) Wight & Arn. in Wight, Contrib. Ind. Bot. 49. 1834; Wight, Ic. t. 588. 1840-43.

Sap milky (?). Leaves linear-lanceolate, puberulous on midrib above, 3-5 cm long, with rounded base and acute apex. Cymes lateral, laxly branching; peduncles about 2 cm long, glabrous. Pedicels 1-1.5 cm long, glabrous. Calyx lobes acute, glabrous. Corolla lobes 2-2.5 mm long, glabrous, pink, globose. Gynostegium sessile.

Indomalaysia. Rare in lower Shiradi Ghat. February. *CJS* 16197.

WATTAKAKA Hasskarl

Note: Some authors synonymize *Wattakaka* under the African genus *Dregea*, others regard it as a subgenus of *Dregea*. We follow Huber (in Abeywickrama, *Fl. Ceylon* 1(1): 50. 1973) in maintaining it as a distinct genus.

Sap watery except milky in the follicles. Cymes umbellate, lateral. Corolla rotate; lobes imbricate to the right; margins ciliolate. Corona of 5 fleshy truncate lobes with cusps at the inner angles resting against the stigma head. Gynostegium short, sessile. Pollinia erect from dark horny corpuscula, 2 per anther, waxy, without pellucid margins.

Wattakaka volubilis (L. f.) Stapf in Curtis, Bot. Mag. sub. t. 8976. 1923; Huber in Abeywickrama, Fl. Ceylon 1: 50. 1973. *Asclepias volubilis* L. f., Suppl. 170. 1781. *Hoya viridiflora* R. Br., Mem. Wern. Nat. Hist. Soc. 1: 27. 1810; Wight, Ic. t. 586. 1840-43. *Dregea volubilis* (L. f.) Bentham ex J. Hooker, Fl. Brit. India 4: 46. 1883. *Marsdenia volubilis* (L. f.) Cooke, Fl. Bombay 2: 166. 1904; Gamble, Fl. Madras 846(595). 1923.

Leaves ovate, sparsely pubescent on the veins, 10-15 cm long; base rounded to cordate; apex acuminate. Corolla lobes 5-7 cm long, pale green.

Indomalaysia. Occasional in plains and Ghats. March-November. *CJS* 13021, 13908, *Stevens* 514.

110. SOLANACEAE

K. N. Gandhi

Herbaceous or suffrutescent. Leaves alternate, often unequally paired in

upper parts; stipules 0; blade usually simple; venation pinnate. Flowers cymose or solitary and terminal but sometimes oppositifoliate, internodal or pseudo-axillary; bracts and bracteoles rarely present; flowers usually bisexual, regular or slightly irregular, usually 5-merous. Calyx gamosepalous, dentate to partite, usually persistent. Corolla gamopetalous, usually plicate or convolute. Stamens usually 5, usually inserted below midcorolla; filaments free; anthers usually dehiscing by slits or pores. Disc hypogynous. Ovary superior, usually 2-locular; ovules many, axillary; style simple, filiform; stigma dilated to 2-lobed. Fruit a berry or capsule, sometimes enclosed within an inflated calyx; seeds many, compressed, smooth or pitted.

1 Fruit a capsule.....**Datura**
1 Fruit a berry.
2 Anthers connivent into a core around style, dehiscing by pores.
3 Flowers in cymes.....**Solanum**
3 Flowers in fascicles.....**Lycianthes**
2 Anthers not connivent, dehiscing longitudinally.
4 Flowers in paniculate cymes; corolla narrow, tubular.....**Cestrum**
4 Flowers solitary, fascicled or in simple cymes; corolla rotate or campanulate.
5 Calyx small in fruit.....**Capsicum**
5 Calyx distinctly enlarged in fruit and enclosing the latter.
6 Calyx lobes partite, winged at base; ovary 3-5-locular.....**Nicandra**
6 Calyx toothed or lobed; ovary 2-locular.
7 Flowers usually in fascicles.....**Withania**
7 Flowers usually solitary.....**Physalis**

CAPSICUM Linnaeus

Herbs. Leaves membranous. Flowers usually solitary. Calyx broadly campanulate, truncate or minutely toothed. Corolla rotate, 5-lobed, valvate. Disc inconspicuous. Fruit a berry, with slightly enlarged calyx, often cylindrical and attenuate toward apex; seeds smooth, discoid.

Capsicum annuum L., Sp. Pl. 188. 1753; Gamble, Fl. Madras 941(661). 1923; Heiser & Pickersgill, Taxon 18: 278. 1969.

Erect herbs. Leaf blade elliptic-obovate, acuminate, to 11×3.5 cm, minutely pubescent. Pedicels 1.5-2 cm long, pendulous. Calyx to 3 mm long. Corolla white, to 8 mm long. Capsule 4-6 mm long, green turning red with age.

Native of Tropical America. Introduced and extensively cultivated as a spice across plain; occasionally found wild near habitations. June-February. *CJS* 13900, 14750.

Note: *Capsicum frutescens* L. (*C. fastigiatum* Bl.: Wight, Ic. t. 1617. 1850) which is a perennial with smaller nodes and 2-3 greenish flowers per node is the commonly escaping species in India.

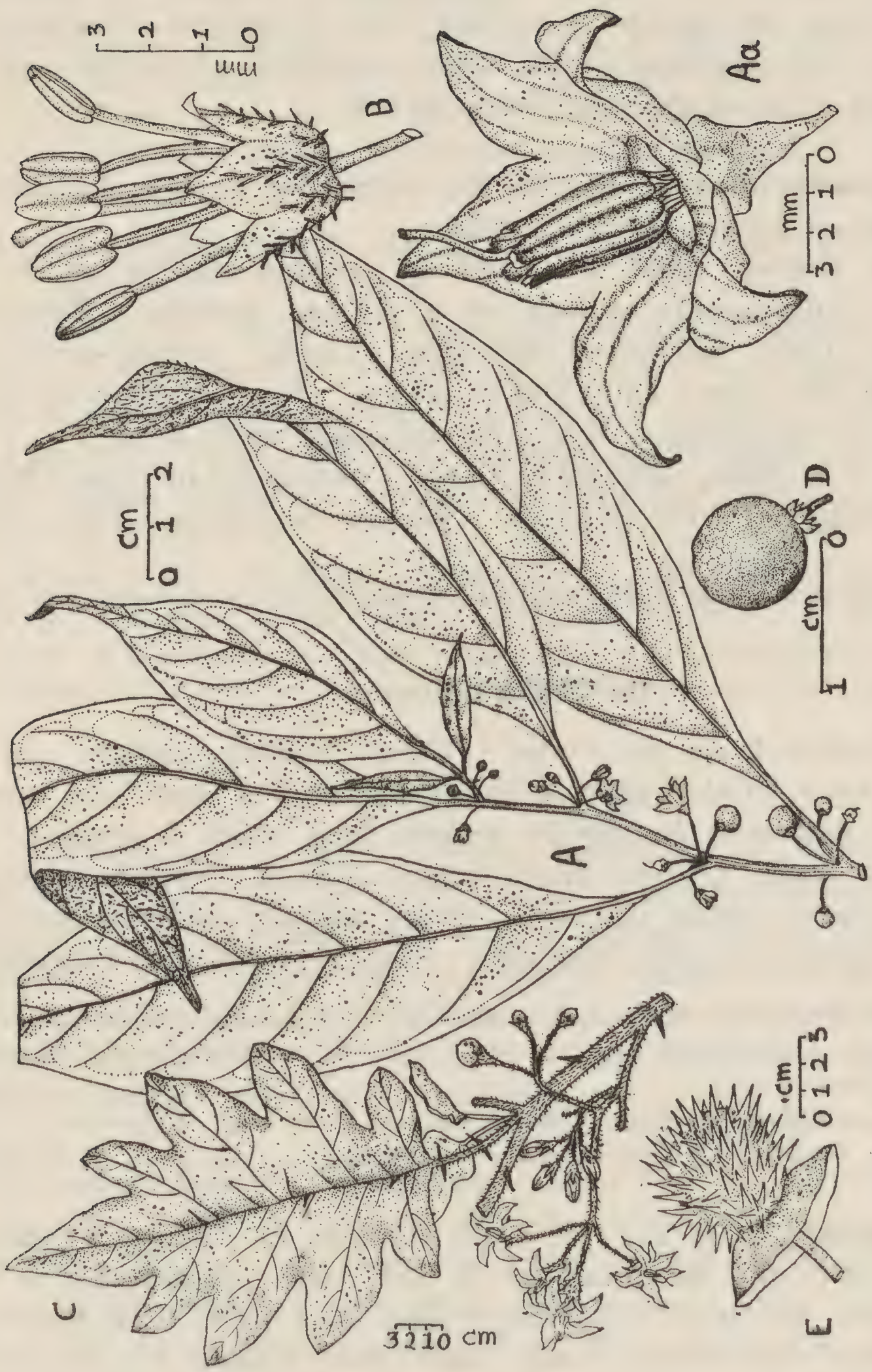


Fig. 88. SOLANACEAE. *A.* *Lycianthes laevis*: flowering branch; *Aa*, flower. *B.* *Physalis minima*: flower without corolla. *C.* *Solanum torvum*: flowering twig (upland form). *D.* *Solanum nigrum*: fruit. *E.* *Datura metel*: fruit.

CESTRUM Linnaeus

Erect or straggling shrubs or trees. Leaves membranous. Inflorescence axillary, usually a paniculate cyme; bracts and bracteoles short. Flowers short-pedicelled. Calyx campanulate or tubular, 5-dentate or lobed. Corolla with narrow tube; lobes erect or reflexed. Stamens 5, inserted above the middle of corolla, almost included. Ovary few-ovuled. Berry subtended by calyx, ovoid; seeds smooth.

Cestrum nocturnum L., Sp. Pl. 191. 1753; Bor & Raizada, Indian Climbers & Shrubs 119, t. 45. 1954.

Scandent shrubs. Leaf ovate-oblong, acute-acuminate at apex, rounded or subattenuate at base, to 15×5 cm, glabrous. Peduncle glabrescent. Calyx tubular, 3 mm long. Corolla greenish-white, to 2.5 cm long; lobes erect, hairy within, plicate. Staminal filaments with a linear short appendage at base. Berries small, white, ovoid.

Native of West Indies, cultivated in Tropics. Occasional in upper Ghats, often as a hedge. Rarely an escape. January-November. *CJS* 12890, 13378.

Note: The flowers open at night, giving out a pleasant scent and close during the day.

DATURA Linnaeus

Usually coarse herbs or shrubs. Flowers solitary, axillary, large, pedicelled, erect. Calyx tubular, usually 5-lobed at apex; the upper part usually deciduous, leaving the annular base which is persistent or enlarged in fruit. Corolla funnel-shaped, plicate. Stamens inserted near the base of corolla, included. Ovary partially and spuriously 4-locular. Capsule 4-locular, often spiny, 4-valved or dehiscing irregularly.

1 Leaves entire or angled with acute lobes, minutely grey-pubescent. Corolla more than 12 cm long. Capsule with large calyx base, dehiscing irregularly at top, recurved; seeds pale brown.....*D. metel*

1 Leaves sinuate, slightly pubescent. Corolla less than 12 cm long. Capsule with small calyx base, dehiscing by 4 valves, erect; seeds black.....*D. stramonium*

Datura metel L., Sp. Pl. 179. 1753; Gamble, Fl. Madras 949(660). 1923; Sant., Fl. Khandala ed. 3, 174. 1967. *Datura fastuosa* L., Syst. Nat. ed. 10, 2: 932. 1759; Wight, Ic. t. 1396. 1848; Gamble, *l.c.* *Datura alba* Nees, Trans. Linn. Soc. London 17: 73. 1837; Wight, Ic. t. 852. 1844-1845. *Datura fastuosa* var. *alba* (Nees) C. B. Clarke in J. Hooker, Fl. Brit. India 4: 243. 1883; Gamble, *l.c.* *Datura metel* var. *fastuosa* (L.) Safford, J. Wash. Acad. Sci. 11: 176, f. 1c. 1921.

Undershrubs. Leaf blade entire, angled or irregularly toothed,

ovate, oblique, to 12×9 cm, minutely grey-pubescent. Calyx herbaceous, terete, 7 cm long. Corolla white, 16 cm long. Staminal filaments hairy at base. Capsule with deltoid spines, a recurved pedicel and distinct, enlarged calyx base, dehiscing irregularly; seeds thickened but compressed, auricled, pale brown, to 6 mm long.

Paleotropics. Frequent in disturbed areas across the plain. Flowering and fruiting throughout the year. *CJS* 11968, *HFP* 508.

Note: Danert (*Die Pharmazie* 9: 357-358. 1954) recognized many varieties of *Datura metel* as well as *D. stramonium.* Schoenbeck-Temesy (in Rechinger, *Fl. Iranica* 100: 46. 1972) accepts *D. fastuosa* and considers *D. metel* a *nom. conf.*

Datura stramonium L., Sp. Pl. 179. 1753; Gamble, Fl. Madras 941 (660). 1923.

Undershrubs. Petiole 1-3 cm long; leaf blade sinuate, lanceolate, acute at apex, narrowed at base, to 12×6 cm, membranous, sparsely pubescent. Calyx membranous, 5-lobed, 3 cm long. Corolla white, 6-9 cm long; lobes 5, cuspidate. Staminal filaments hairy at base. Capsule subglobose, spinous, subtended by calyx base, 4-valved; seeds black, reniform, 3 mm long.

Introduced and naturalized. Frequent in wasteland, along roadsides, railway lines and on river beds. April-November. *CJS* 9576, 11463.

Note: *Brugmansia suaveolens* (Willd.) Berchtold & Presl is a common shrub with large pendulous flowers, used for hedges in coffee estates. It has not been seen in fruit.

LYCIANTHES Hassler

Unarmed herbs or shrubs. Leaves usually entire. Flowers generally fascicled in upper axils, pedicelled, small. Calyx campanulate or cupular, dentate. Corolla rotate; lobes slightly connate at base, valvate, ovate. Stamens 5, inserted near the base of corolla; anthers longer than filaments, connivent into cone around the style, dehiscing inward by apical pores. Ovary usually many-ovuled. Fruit a berry, subglobose, seated on the slightly enlarged calyx; seeds reticulate.

Lycianthes laevis (Dunal) Bitter, Abh. Nat. Ver. Bremen 24: 484. 1920; Backer & Bakh. f., Fl. Java 2: 476. 1965 ('*levis*'). *Solanum laeve* Dunal, Solan. Synop. 22. 1816; Gamble, Fl. Madras 936(657). 1923. *Solanum bigeminatum* Nees, Tran. Linn. Soc. London 17: 42. 1837. *Lycianthes bigeminata* (Nees) Bitter, Abh. Nat. Ver. Bremen 24: 480. 1920.

Straggling undershrubs. Leaf elliptic-lanceolate, acuminate, to 20×5.5 cm, sparsely pubescent above, membranous. Pedicles 1.5 cm long. Calyx glabrous, 2-3 mm, saucer-shaped in fruit. Corolla white-purplish, to 1 cm across. Berries 7-8 mm across, yellow-red; seeds angular.

South India. Fairly common in dense undergrowth at Kenchankumri State Forest (lower Shiradi Ghat). April-October. *CJS* 14219, *HFP* 2029.

NICANDRA Adanson *nom. cons.*

Erect herbs. Leaves coarsely serrate, oblique at base. Flowers solitary, axillary, pedicelled, 5-merous. Calyx deeply lobed, accrescent and enclosing fruit. Corolla campanulate; limb plicate, obscurely lobed. Ovary 3-5-locular, many-ovuled; style short; stigma shortly 3-5-parted. Berry globose; seeds pitted.

Nicandra physalodes (L.) Gaertner, Fruct. 2: 237, t. 141, f. 2. 1791 ('*physaloides*'); Gamble, Fl. Madras 941(661). 1923. *Atropa physalodes* L., Sp. Pl. 181. 1753.

Stem angular. Leaves ovate, narrowed into a long petiole, to 15×7 cm (including petiole), membranous. Pedicels 3 cm long. Calyx becoming scarious in fruit; lobes ovate, acute at apex, winged at base. Corolla 2.5 cm long; tube white; limb blue. Berry 1.5-2 cm across, greenish-white, turning yellow with age.

Native of Peru. Occasionally found as a naturalized weed. July-December. *HFP* 1241, 2061.

PHYSALIS Linnaeus

Herbs. Flowers usually solitary, axillary, 5-merous. Calyx campanulate, toothed or lobed, accrescent and inflated in fruit, enclosing the latter. Corolla subrotate; limb plicate, shortly lobed. Berry globose, enveloped in the bladderlike calyx.

Physalis minima L., Sp. Pl. 183. 1753; Gamble, Fl. Madras 939(659). 1923.

Glabrescent. Leaves entire, sinuate or toothed, ovate, rounded at base, to 5×3 cm. Pedicels 0.5-1 cm long. Fruiting calyx 1.5-2 cm long, scarious; teeth connivent. Corolla to 7 mm long, yellow, sometimes purplish within at base. Berry to 0.6 cm across; seeds minutely rugose.

Naturalized from Neotropics. Occasional weed in disturbed places across the plain and upper Ghats. All seasons. *CJS* 10784, 13451.

SOLANUM Linnaeus

Inflorescence usually internodal. Flowers bisexual or upper ones staminate, pedicelled. Calyx campanulate or tubular, sometimes accres-

cent. Corolla rotate; limb plicate, lobed. Anthers connivent into a cone around the style, poricidal. Berry partially enclosed by calyx.

1 Plants climbing.....*S. seaforthianum*
1 Plants not climbing.
2 Plants glabrous or with simple hairs.....*S. nigrum*
2 Plants stellately pubescent.
3 Plants unarmed.....*S. erianthum*
3 Plants armed.
4 Corolla blue.....*S. violaceum*
4 Corolla white.
5 Prickles few, normally 0-2 on midrib beneath.....*S. torvum*
5 Prickles many, normally 3-more on midrib beneath.
6 Corolla and berries hirsute.....*S. stramoniifolium*
6 Corolla and berries almost glabrous.....*S. khasianum*

Solanum erianthum D. Don, Prodr. 96. 1825; Roe, Taxon 17: 176. 1968; Brittonia 24: 251. 1972. *Solanum verbascifolium* auct. non L.: Wight, Ic. t. 1398. 1848; Gamble, Fl. Madras 936(657). 1923.

Unarmed, densely stellately tomentose. Petiole 3 cm long; leaf blade generally entire, ovate-oblong, subtruncate at base, 15-20 × 7-10 cm. Cyme apparently terminal, corymbose. Corolla white, stellately tomentose without, slightly exceeding calyx. Berries sparsely, stellately hairy, globose, turning yellow, to 0.7 cm; seeds scaly, minutely papillose.

Tropics. Fairly common at Belur & Belvathally (scrub) in ravines and shady places. December-September. *CJS* 11978, 12873.

Solanum khasianum C. B. Clarke in J. Hooker, Fl. Brit. India 4: 234. 1883.

Tomentose, armed. Leaf ovate-lanceolate, subcordate at base, to 9 × 6 cm. Cyme lateral, 1 to 4-flowered. Pedicels 1.5 cm long, sometimes spinous. Corolla white, to 1 cm, sparsely pubescent. Berry globose, 3-4 cm across, glabrous.

India. Occasional in western plain and upper Ghats. October-May. *CJS* 12252, 13466.

Solanum nigrum L., Sp. Pl. 186. 1753; Gamble, Fl. Madras 936(657). 1923. *Solanum rubrum* Miller, Gard. Dict. ed. 8, n. 4. 1768, non L., 1767; Wight, Ic. t. 344. 1840.

Unarmed herbs. Leaf entire or slightly toothed, ovate, decurrent on the petiole, to 7 × 3.5 cm, glabrous or sparsely pubescent. Cyme umbellate, axillary or lateral, 4-8-flowered. Pedicels to 0.8 cm long. Corolla white, 0.5 cm long. Berry globose, glabrous, to 0.7 cm across; seeds minutely pitted.

Temperate and Tropical parts of the World. Herbs scattered across

the plain and in upper Ghats, along roadsides, in waste and cultivated lands. All seasons. *CJS* 16110, *HFP* 2098.

Solanum seaforthianum Andr., Bot. Rep. 8: t. 504. 1808; Bor & Raizada, Indian Climbers & Shrubs 127. 1954.

Glabrous climbers. Leaves ovate, deeply pinnatifid (divided almost to the base so that the lobes appear as leaflets) to 7×7 cm, lobes ovate-lanceolate, 3-4×1-2 cm, scarcely pubescent. Cyme panicled, lateral and terminal. Calyx short, truncate. Corolla blue, to 1 cm long. Berries globose, 1 cm, bright red; seeds pitted.

Native of S. America. Introduced and often run wild. Occasional across plain on hedges. January-October. *CJS* 13521, *HFP* 2060.

Solanum stramoniifolium N. Jacq., Misc. 2: 298. 1781 ('*stramonifolium*'); Raizada, Indian Forester 94: 450. 1968. *Solanum ferox* auct. non L.: Gamble, Fl. Madras 937(658). 1923.

Densely stellately tomentose, spinous undershrubs. Leaf ovate-lanceolate, with shallow, triangular lobes, somewhat cordate, to 30×26 cm, spinous along the nerves. Cyme lateral, stellately tomentose. Corolla white, tomentose on the back. Style glabrous. Berry globose, covered with needle-like hairs, 4 cm across; seeds more or less smooth.

South E. Asia, Indomalaysia. Occasional undershrubs in lower Ghats in undergrowth. May-February. *CJS* 12637, *HFP* 126.

Note: In the original description of *S. ferox*, Linnaeus makes it clear that the hairy berry is wholly covered by the armed calyx. *S. stramoniifolium* was established by Jacquin who pointed out that the unarmed calyx was hardly enlarged in fruit. The true *S. ferox* reported by Linnaeus as 'In Malabaria' has apparently not since been found in India (cf. Kerr in Craib, *Fl. Siam. Enum.* 3(2): 37 & 43. 1954).

Solanum torvum Sw., Prodr. 47. 1788; Wight, Ic. t. 345. 1840; Gamble, Fl. Madras 937(658). 1923.

Large, stellately hairy shrubs, with prickles usually only on stem and petioles. Leaf ovate-lanceolate, with shallow, somewhat triangular lobes, cordate-oblique at base, 22×15 cm. Cyme lateral, corymbose, few-many-flowered. Pedicel 1.5-2 cm long, often glandular-hairy. Corolla white, stellately hairy outside, to 1.5 cm long. Style glabrous. Berry globose, glabrous, 1 cm; seeds somewhat angular, smooth.

Tropical America, Indomalaysia. Frequent shrubs in western plain and across Ghats, along roadside, in wasteland. Flowering and fruiting throughout the year. *CJS* 11591, 13379.

Note: One collection (*CJS* 10174) seems to be an upland form of *S. torvum*. It has pinnatifid leaves and non-glandular pedicels.

Solanum violaceum Ortega, Hort. Matr. Dec. 56. 1798. *Solanum indicum* auct. non L.: Wight, Ic. t. 346. 1840; Gamble, Fl. Madras 938(658). 1923.

Armed with short spines, stellately tomentose. Leaf shallowly lobed, ovate-oblong, somewhat oblique, to 7×5 cm. Cyme short, few-many-flowered. Pedicels 1.5 cm long, smooth or prickly. Calyx sometimes prickly. Corolla blue, slightly stellately hairy, 1-1.5 cm long. Berries globose, 1 cm across, glabrous, yellow; seeds minutely pitted.

Tropical Africa, Indian subcontinent. Common shrubs across the plain in disturbed areas. All seasons. *CJS* 13444, *HFP* 2075.

Note: We are grateful to Mr. F. N. Hepper (Kew) for straightening out this nomenclature.

* * *

Solanum melongena L. the 'Brinjal' and *Solanum tuberosum* L. the 'potato' with their many varieties and hybrids are commonly cultivated in the plains as rain-fed crops. *Solanum wendlandii* J. Hooker is occasionally found in some gardens.

WITHANIA Pauquy *nom. cons.*

Unarmed. Leaves entire, often oblique. Flowers fasciculate, shortly pedicelled. Calyx campanulate, 5-6-toothed, accrescent. Corolla narrowly campanulate, 3-6-lobed, valvate. Stamens 5. Berry globose, enclosed in the scarious, enlarged calyx.

Withania somnifera (L.) Dunal in DC., Prodr. 13(1): 453. 1852; Gamble, Fl. Madras 940(660). 1923. *Physalis somnifera* L., Sp. Pl. 182. 1753; Wight, Ic. t. 853. 1844-1845.

Erect, minutely stellate-tomentose herbs. Leaf ovate, to 5.5×3.5 cm, densely hairy beneath and sparsely above. Flowers 3-10-fascicled, bisexual; pedicels 0.6 cm long. Fruiting calyx 2 cm long, pubescent or glabrous. Corolla greenish-yellow. Berry 7 mm across.

From Canary Islands to Indian region. Collected once at Hirisave (eastern plain) in fruit on October 27, 1969; found growing in wasteland. *CJS* 16107.

* * *

Lycopersicon lycopersicum (L.) Karsten the 'tomato' is cultivated to a limited extent. *Nicotiana tabacum* L., the 'tobacco' is increasingly cultivated in the plains. Cured leaves are marketed at Magge.

111. CONVOLVULACEAE

K. N. Gandhi

Usually scandent and herbaceous to suffrutescent. Leaves alternate;

stipules 0; pseudostipules occasionally present; blade simple or variously lobed, entire; venation pinnate or palmate. Inflorescence mostly axillary, of 1-many-flowered cymes; bracts present, often caducous. Flowers bisexual, regular, generally 5-merous. Sepals free, imbricate, persistent, often accrescent. Corolla gamopetalous; limb usually plicate. Stamens adnate to the corolla; filaments sometimes hairy at base; anthers dorsifixed; pollen smooth or spinulose (visible with hand-lens against dark background). Disc usually annular, occasionally absent. Ovary superior, usually 2-locular with 2 basal ovules per locule; styles usually simple; stigma usually biglobular. Fruit a capsule, berry or nut, 1-6-seeded.

1 Styles 2; stigmas 4.....**Evolvulus**
1 Style 1 or 0.
2 Style 0; stigmas 5-10-ribbed; petals bilobed.....**Erycibe**
2 Style 1; stigmas 1 or 2, globular or elongated.
3 Pollen smooth.
4 Outer sepals larger than inner; stigmas ovate-oblong; flowers white with pink throat .....**Hewittia**
4 Outer sepals equaling or smaller than inner; stigmas biglobular; flowers yellow to white.....**Merremia**
3 Pollen spinulose.
5 Stigmas linear.....**Rivea**
5 Stigmas biglobular or capitate.
6 Fruits indehiscent, fleshy or leathery; corolla pubescent.....**Argyreia**
6 Fruits dehiscent, thin walled; corolla mostly glabrous (except *I. eriocarpa, muricata* and *obscura*).....**Ipomoea**

ARGYREIA Loureiro

Leaves simple, usually argentosericeous. Cyme peduncled; bracts minute to large. Flowers showy, pedicelled. Sepals subequal or inner ones much narrower, often hairy outside, glabrous within, accrescent or not. Corolla usually pilose outside. Pollen spinulose. Disc prominent. Ovary 2-4-locular, 4-ovuled; stigma biglobular. Berry coriaceous or fleshy, indehiscent.

1 Leaves pilose on both the surfaces.
2 Sepals less than 0.6 cm long.....*A. pomacea*
2 Sepals more than 1 cm long.....*A. pilosa*
1 Leaves glabrous above.
3 Pubescence on the stem and leaves beneath silvery; ovary 2-locular; stamens exserted .....*A. imbricata*
3 Pubescence not silvery; stamens included.
4 Leaves broadly cuneate. Ovary 4-locular. Plants suberect.....*A. cuneata*
4 Leaves round or acute at base. Ovary 2-locular. Plants twining.....*A. elliptica*

Argyreia cuneata (Willd.) Ker-Gawler, Bot. Reg. t. 661. 1882; Gamble,

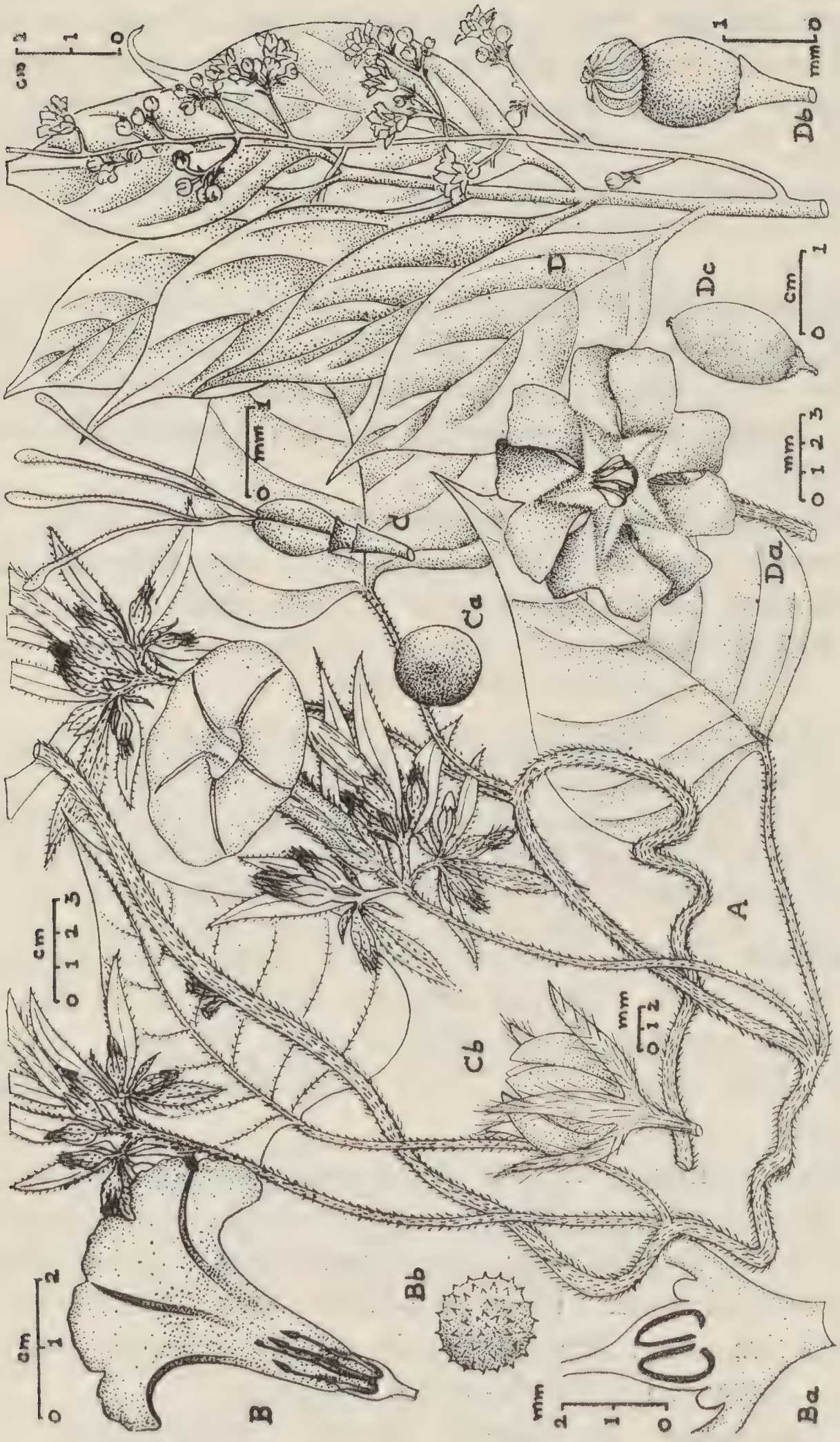


Fig. 89. CONVOLVULACEAE. *A. Argyreia pilosa*: flowering branch. *B. Ipomoea cairica*: section of flower; *Ba*, section through ovary; *Bb*, pollen. *C. Evolvulus alsinoides*: gynoecium; *Ca*, pollen; *Cb*, fruit. *D. Erycibe paniculata*: flowering twig; *Da*, flower; *Db*, gynoecium; *Dc*, fruit.

Fl. Madras 909(638). 1923. *Convolvulus cuneatus* Willd., Sp. Pl. 1: 873. 1798. *Rivea cuneata* Wight, Ic. t. 890. 1844-1845.

Suberect, silky shrubs. Leaf obovate-lanceolate, emarginate or obtuse and apiculate, broadly cuneate at base, 4-7×2-4 cm, glabrous above. Peduncle 1-2 cm long, 3 or more-flowered. Sepals ovate, to 0.5 cm long. Corolla funnel-shaped, bright red, 3-4 cm long. Stamens included, unequal. Ovary 4-locular. Berry leathery, yellow-brown, 1.2-1.5 cm across.

South India. Common across the plain. July-February. *CJS* 9225, *HFP* 386.

Argyreia elliptica (Roth) Choisy, Mem. Soc. Phys. Geneve 6: 417. 1834; Sant., Fl. Khandala ed. 3, 172. 1967. *Ipomoea elliptica* Roth, Nov. Pl. Sp. 113. 1821. *Lettsomia elliptica* (Roth) Wight ex C. B. Clarke in J. Hooker, Fl. Brit. India 4: 192. 1883; Gamble, Fl. Madras 911(640). 1923.

Woody twiner with appressed pubescence on young parts. Leaf elliptic-ovate, rounded or acute at base, to 6×4 cm, glabrous above. Cyme short-peduncled, few-many-flowered. Sepals ovate, to 0.4 cm long. Corolla funnel-shaped, violet, to 3 cm long. Stamens included. Ovary 2-locular.

South India, Sri Lanka. Collected in flower, from Bourdalboore Reserve Forest (scrub) on August 13, 1971. *CJS* 10827.

Note: *Lettsomia elliptica* (Roth) is commonly attributed to Wight (Ic. 4(2): 12 (comment preceding Expl. of t. 1356). 1848 but Wight only cited *Argyreia elliptica* Choisy as "will probably be absorbed in *Lettsomia*." This is not valid publication under Art. 33.

Argyreia imbricata (Roth) Sant. & Patel, Trans. Bose Res. Inst. Calcutta 22: 40. 1958. *Ipomoea imbricata* Roth, Nov. Pl. Sp. 112. 1821. *Lettsomia aggregata* Roxb., [Hort. Beng. 13. 1814, *nom.*] Fl. Ind. 2: 76. 1824; Wight, Ic. t. 1359. 1848; Gamble, Fl. Madras 910(639). 1923.

Silvery pubescent, climbing shrubs. Leaf ovate, emarginate or subacute at apex, cordate, glabrous above, 4-11×3-9 cm. Cyme capitate, often panicled; peduncle 2-5 cm long; bracts spathaceous. Sepals elliptic-ovate, obtuse, red within; outer 2 larger, 0.8-1.2 cm long. Corolla funnel-shaped, pink, 1-2 cm long; limb distinctly lobed. Stamens exserted. Ovary 2-locular. Berry red, subglobose, 0.8 cm across.

South India. Occasional in eastern plains. August-April. *CJS* 13219, 15176.

Argyreia pilosa Wight & Arn., Pugill. Pl. Ind. Or. 38. 1836; Gamble, Fl. Madras 908(638). 1923.

Tawny hirsute climbers. Leaf broadly ovate, acuminate, shallowly cordate, 5-13×4-9 cm. Cyme subcapitate. Peduncle 5-10 cm long;

bracts ovate-lanceolate, acute, to 2×0.6 cm. Sepals lanceolate, to 0.8×0.4 cm. Corolla campanulate, pink, 5-7 cm long; limb wide. Stamens included, unequal. Ovary 4-locular. Berry orange-yellow, 1-1.5 cm across, often shortly apiculate.

South India. Occasional in western plains and upper Ghats. August-November. *CJS* 9966, *HFP* 1969.

Argyreia pomacea (Roxb.) Choisy, Mem. Soc. Phys. Geneve 6: 414. 1834; Gamble, Fl. Madras 908(638). 1923. *Lettsomia pomacea* Roxb., Fl. Ind. 2: 83. 1824. *Rivea pomacea* (Roxb.) Wight, Ic. t. 888. 1944-45.

Hispid climbers. Leaf elliptic-ovate, rounded at base, 6-8×3-5 cm. Cyme corymbose, many-flowered; peduncle 4-6 cm long; bracts linear. Sepals ovate, to 0.4 cm long. Corolla campanulate, violet, to 3 cm long. Stamens included, unequal. Ovary 4-locular. Berry yellow-brown, 1.5 cm across.

Southern India (lower). Collected once at Uchangi in flower, on September 23, 1971. *HFP* 2143.

ERYCIBE Roxburgh

Leaves simple, coriaceous. Inflorescence usually paniculate; bracts minute, caducous. Sepals subequal, hairy outside. Corolla pilose outside; limb densely lobed; lobes bilobed. Staminal filaments short; pollen smooth. Disc inconspicuous. Ovary 1-locular with 4 basal ovules; style 0; stigma funnel-shaped, 5-10-ribbed. Berry subfleshy, ellipsoid, 1-seeded.

Erycibe paniculata Roxb., Pl. Cor. t. 159. 1798; Gamble, Fl. Madras 930(653). 1923.

Woody, rusty-tomentose climbers. Leaf elliptic-lanceolate, cuspidate, shortly acute at base, 7-10×2-4.5 cm, glabrous with age, shining. Panicle many-flowered. Sepals suborbicular, to 0.3 cm long. Corolla pale white, 1 cm long. Anthers apiculate. Berry black, shining, to 2×1 cm.

India including Himalayas & Andaman Islands, Sri Lanka. Occasional in upper Ghats. October-March. *CJS* 16371, *HFP* 1140.

EVOLVULUS Linnaeus

Prostrate to ascending (not climbing), hairy herbs or undershrubs. Leaves simple. Inflorescence usually 1-few-flowered cyme; bracts small. Sepals subequal. Corolla rotate or funnel-shaped. Pollen smooth.

Disc small or absent. Ovary usually 2-locular, 4-ovuled; styles 2, free, each with 2 linear stigmas. Fruit a capsule.

Evolvulus alsinoides (L.) L., Sp. Pl. ed. 2, 2: 392. 1762; Gamble, Fl. Madras 923(648). 1923; Stearn, Taxon 21: 649. 1972. *Convolvulus alsinoides* L., Sp. Pl. 157. 1753.

Herbs with a woody rootstock and many, prostrate, slender, spreading branches. Leaves lanceolate-orbicular, 0.6-1×0.2-0.6 cm. Peduncle axillary, slender, 1-3-flowered. Sepals ovate, to 0.3 cm long. Corolla to 0.6 cm long, blue.

Paleotropics. Frequent across the plains. All seasons. A polymorphic taxon. *HFP* 1253, 2109.

HEWITTIA Wight & Arnott

Twining herbs. Leaves simple, membranous. Inflorescence 1-few-flowered, initially subcapitate, later elongating into cymes; bracts 2, linear. Sepals slightly accrescent in fruit, outer 3 larger, inner 2 much smaller. Corolla campanulate to funnel-shaped, pilose outside; limb shallowly lobed. Staminal filaments dilated at base; pollen smooth. Disc annular. Ovary pilose, 1 or incompletely 2-locular, 4-ovuled; stigmas 2, short, ovate-oblong. Fruit a capsule, globose, pilose, 1-locular, 4-valved. Seeds dull black with pubescent hilum.

Hewittia sublobata (L. f.) Kuntze, Rev. Gen. Pl. 441. 1891; Ooststr. in Steenis, Fl. Malesiana ser. 1, 4: 438. 1953. *Convolvulus sublobatus* L. f., Suppl. 135. 1781. *Convolvulus bicolor* Vahl, Symb. Bot. 3: 25. 1794. *Hewittia bicolor* (Vahl) Wight & Arn., Madras J. Lit. Sci. 5: 22. 1837; Wight, Ic. t. 835. 1844-45; Gamble, Fl. Madras 924(649). 1923.

Leaf ovate, acuminate, cordate, to 6×5 cm. Peduncle filiform, to 6 cm long. Sepals ovate, acute, to 1 cm long. Corolla to 2 cm long, white, pinkish at throat. Capsule thin walled, to 1 cm across.

Paleotropics. Occasional in lower Shiradi Ghat. August-January. *CJS* 15820, *HFP* 943.

IPOMOEA Linnaeus

Usually twining herbs. Leaves membranous-chartaceous; pseudostipules sometimes present. Inflorescence sessile or peduncled, 1-many-flowered cyme, sometimes panicled; bracts and bracteoles short and caducous. Sepals sometimes accrescent. Stamens unequal; pollen spinulose. Disc annular. Ovary usually 2-locular and 4-ovuled; stigma

capitate, often biglobular. Fruit a capsule, globose or ovoid, thin walled, dehiscing by 4-6 valves or irregularly. Seeds glabrous or hairy.

1 Inflorescence subsessile. Flowers less than 1 cm long.....*I. eriocarpa*
1 Inflorescence distinctly peduncled. Flowers more than 1 cm long.
 2 Plants of aquatic or marshy areas, with trailing and rooting or floating stem..*I. aquatica*
 2 Plants terrestrial (not rooting at nodes or floating).
  3 Sepals awned at or below the apex.
   4 Corolla red. Sepals 0.3-0.5 cm long.....*I. hederifolia*
   4 Corolla white or purple. Sepals 0.5-1.2 cm long.
    5 Stout climbers. Flowers white; corolla 7-12 cm long.....*I. alba*
    5 Slender climbers. Flowers violet or purple; corolla 3-6 cm long.....*I. muricata*
  3 Sepals obtuse, acute, acuminate or apiculate, not awned.
   6 Leaves lobed.
    7 Leaves palmately 3-lobed.....*I. nil*
    7 Leaves palmately dissected to the base.....*I. cairica*
   6 Leaves entire.
    8 Leaves less than 1 cm broad. Sepals strongly accrescent in fruit....*I. barlerioides*
    8 Leaves more than 2 cm broad. Sepals not or slightly accrescent.
     9 Cyme shortly panicled.....*I. staphylina*
     9 Cymes not panicled.
      10 Stout climbers. Sepals subequal, 1-1.2 cm long.....*I. illustris*
      10 Slender climbers. Sepals unequal, 0.5 cm long.....*I. obscura*

Ipomoea alba L., Sp. Pl. 161. 1753; Ooststr. in Steenis, Fl. Malesiana ser. 1, 4: 480. 1953. *Convolvulus aculeatus* L., Sp. Pl. 155. 1753. *Ipomoea bona-nox* L., Sp. Pl. ed. 2, 228. 1762. *Calonyction bona-nox* (L.) Boj., Hort. Maurit. 227. 1837; Gamble, Fl. Madras 920(646). 1923.

Glabrescent, stout twiners. Leaf entire or angled, ovate, acuminate, cordate, 15×10-12 cm. Cyme few-flowered; peduncle 2-4 cm long; bracts caducous. Sepals awned, outer 2-3 smaller, inner ones 1 cm long (excluding the awn). Corolla white, salverform; tube 8-10 cm long, narrow; limb broad, slightly lobed, wide. Stamens exserted. Capsule ovoid-globose, to 1×0.5 cm, glabrous.

Native of Tropical America. Introduced and naturalized near habitations. October-December. *CJS* 15658, *HFP* 1197.

Ipomoea aquatica Forsk., Fl. Aegyp.-Arab. 44. 1775; Ooststr. in Steenis, Fl. Malesiana ser. 1, 4: 473. 1953. *Ipomoea reptans* Poir. in Lam., Encycl. Suppl. 3: 460. 1814 [non *Convolvulus reptans* L.]; Gamble, Fl. Madras 916(643). 1923. *Ipomoea repens* auct. excl. *Convolvulus repens* L.: Roth, Nov. Pl. Sp. 110. 1821, non *I. repens* Lam., 1791.

Trailing and rooting, sometimes floating, glabrescent herbs; stem spongy. Leaf various, entire-angled, ovate-triangular or oblong-lanceolate, acute-emarginate, cordate-hastate, 4-9×2-5 cm. Cyme

1-few-flowered; peduncle 5-8 cm long; bracts minute. Flowers distinctly pedicelled. Sepals ovate, obtuse or acute at apex, inner ones slightly larger, 0.8-1 cm long. Corolla purplish-white, funnel-shaped, 4 cm long; limb subentire. Capsule globose, to 1 cm across, glabrous or greyish-pubescent.

Tropics. Often found near tanks, across the plain. November-January. *CJS* 11460, 12016.

Ipomoea barlerioides (Choisy) Bentham ex C. B. Clarke in J. Hooker, Fl. Brit. India 4: 201. 1883; Gamble, Fl. Madras 915(642). 1923. *Aniseia barlerioides* Choisy, Mem. Soc. Phys. Geneve 6: 484. 1834.

Tawny hispid, slender, trailing herbs. Leaf entire, oblong-lanceolate, truncate to shallowly cordate at base, 2-3.5×0.4-0.7 cm. Flowers solitary; peduncle 4-6 cm long; bracts linear, acuminate, to 0.7 cm long. Sepals subequal, lanceolate, acute, to 2 cm long, markedly accrescent in fruit. Corolla funnel-shaped, pink, to 6 cm long; limb subentire. Capsule ovoid, to 0.5 cm long.

Upper Burma, India. Collected in flower at Vanagur peak (upper Bisle Ghat) on October 30, 1969. *CJS* 15488.

Ipomoea cairica (L.) Sweet, Hort. Brit. 287. 1827; Gamble, Fl. Madras 918(645). 1921. *Convolvulus cairicus* L., Syst. Nat. ed. 10, 922. 1759. *Ipomoea pulchella* Wight, Ic. t. 156. 1839, non Roth, 1821.

Glabrous, slender twiners; stem subtuberculate. Petiole with small, pseudostipules; leaf blade ovate-orbicular, palmately dissected to the base into 5 elliptic-lanceolate lobes, to 5×4.5 cm; terminal lobe slightly larger; basal lobes often divided. Cyme 1-few-flowered; peduncle 3-4 cm long; bracts minute. Sepals ovate, obtuse, inner ones slightly larger, to 0.7 cm long. Corolla funnel-shaped, purple, to 6 mm long; limb subentire. Capsule globose, to 1 cm across, glabrous.

Paleotropics. Occasional in plains and upper Ghats. All seasons. *CJS* 10127, 13471.

Note: Often cultivated in gardens, sometimes an escape.

Ipomoea eriocarpa R. Br., Prodr. 484. 1810; Ooststr. in Steenis, Fl. Malesiana ser. 1, 4: 462. 1953. *Convolvulus hispidus* Vahl, Symb. Bot. 3: 29. 1794. *Ipomoea hispida* (Vahl) Roemer & Schultes, Syst. 4: 238. 1819, non Zuccagni, 1809; Gamble, Fl. Madras 915(643). 1923. *Ipomoea sessiliflora* Roth, Nov. Pl. Sp. 116. 1821; Wight, Ic. t. 169. 1839.

Slender hispid twiners. Leaf ovate-lanceolate, acuminate, cordate, 5-7×1.4-2 cm. Cyme subsessile, capitate, small; bracts short, linear. Flowers subsessile, short. Sepals narrowly ovate, acuminate, outer ones larger, to 0.7 cm long. Corolla campanulate, to 1 cm long, pilose outside,

pink; limb subentire. Capsule globose, to 0.5 cm across, entirely or partly hairy.

Paleotropics. Collected in flower and fruit at Hirisave (eastern plain) on December 8, 1969. *CJS* 15713.

Ipomoea hederifolia L., Syst. Nat. ed. 10, 925. 1759; O'Donell, Lilloa 29: 45. 1959. *Ipomoea angulata* Lam., Ill. 1: 464. 1793; Ooststr. in Steenis, Fl. Malesiana ser. 1, 4: 481. 1953. *Ipomoea phoenicea* Roxb., Fl. Ind. 2: 92. 1824. *Quamoclit phoenicea* (Roxb.) Choisy, Mem. Soc. Phys. Geneve 6: 433. 1834; Gamble, Fl. Madras 919 (645). 1923.

Slender, glabrescent twiners. Leaf entire-lobed, ovate, acuminate, cordate, to 10×6 cm. Cyme few-many-flowered; peduncle 8-11 cm long; bracts inconspicuous. Sepals distinctly awned on the back, to 4.0 cm long (excluding the awn). Corolla salverform, scarlet, 3-4 cm long; limb short, subentire. Stamens exserted. Ovary 4-locular. Capsule globose, to 0.6 cm across.

Native of Tropical America. Introduced and run wild in upper Ghats and western plains. September-January. *CJS* 10024, 11222.

Ipomoea illustris (C. B. Clarke) Prain, Beng. Pl. 2: 735. 1903; Ooststr. in Steenis, Fl. Malesiana ser. 1, 4: 485. 1953. *Ipomoea campanulata* auct. non L., 1753: Choisy, Mem. Soc. Phys. Geneve 6: 451. 1834; Wight, Ic. t. 1375. 1848; Gamble, Fl. Madras 917(643). 1923. *Ipomoea campanulata* var. *illustris* C. B. Clarke in J. Hooker, Fl. Brit. India 4: 211. 1883.

Stout, softly grey-pubescent climbers. Leaf ovate, acuminate, cordate-truncate, 6-8×4-7 cm, pubescent beneath. Cyme corymbose, few-many-flowered; peduncle 3-5 cm long; bracts caducous. Sepals ellipsoid, outer 3 pubescent outside, inner 2 glabrescent, slightly larger, emarginate, to 1.2 cm long. Corolla campanulate, white-lilac, pink at throat, 6-10 cm long; limb subentire. Capsule globose, glabrous, 1-1.5 cm across.

Indomalaysia. Occasional across the plains. December-February. *CJS* 12354, 15875.

Ipomoea muricata (L.) Jacq., Hort. Schoenbr. 3: 40, t. 323. 1798; Ooststr. in Steenis, Fl. Malesiana ser. 1, 4: 481. 1953. *Convolvulus muricatus* L., Mant. 44. 1767. *Calonyction muricatum* (L.) G. Don, Gen. Syst. 4: 264. 1838; Gamble, Fl. Madras 920(646). 1923.

Glabrescent, slender twiners; stem often muricate. Leaf entire, broadly ovate, shortly acuminate, cordate, 6-10×5-8 cm. Cyme few-many-flowered; peduncle 7-15 cm long; bracts short. Sepals awned, to 0.7 cm long (excluding the awn). Corolla salverform, violet, 5-7 cm

long, pubescent outside; tube widened above; limb subentire. Capsule ellipsoid, smooth, to 0.8 cm across, shortly beaked.

Tropics. Frequent in western plains and upper Ghats. July-December. *CJS* 11228, 17930.

Ipomoea nil (L.) Roth, Cat. Bot. 1: 36. 1797; Ooststr. in Steenis, Fl. Malesiana ser. 1, 4: 465. 1953; Shinners, Taxon 14: 231. 1965. *Convolvulus nil* L., Sp. Pl. ed. 2, 1: 219. 1762. *Ipomoea hederacea* auct. non (L.) Jacquin: C. B. Clarke in J. Hooker, Fl. Brit. India 4: 199. 1883; Gamble, Fl. Madras 917(644). 1923.

Slender, villous herbs. Leaf ovate, cordate, palmately 3-lobed, to 8×7 cm; side lobes acute, middle one larger and acuminate. Cyme umbellate, few-flowered; peduncle 4-8 cm long; bracts linear. Sepals narrowly ovate, acuminate, 2-3 cm long, densely villous toward the base, sparsely upward. Corolla campanulate, blue or pink, to 8 cm long; limb subentire. Capsule 3 (-4)-locular, subglobose, 0.8 cm long.

Tropics. Cultivated and sometimes an escape. April-June. *CJS* 13324, *HFP* 1607.

Ipomoea obscura (L.) Ker-Gawler, Bot. Reg. 3: t. 239. 1817; Gamble, Fl. Madras 916(643). 1923. *Convolvulus obscurus* L., Sp. Pl. ed. 2, 1: 220. 1762.

Slender climbers. Leaf entire-angled, ovate, acuminate, cordate, 4-5×3-5 cm, glabrous or pubescent. Cyme 1-3-flowered; peduncle 3-5 cm long; bracts caducous. Sepals ovate, obtuse and apiculate, to 0.5 cm long. Corolla funnel-shaped, sparsely pubescent outside, 2-3 cm long; limb subentire, creamy-white. Capsule ellipsoid, apiculate, to 0.8 cm across.

Paleotropics. Scattered across the plain. September-March. *CJS* 8837, 9239.

Ipomoea staphylina Roemer & Schultes, Syst. 4: 249. 1819; Gamble, Fl. Madras 917(643). 1923.

Glabrescent, stout, straggling or climbing shrubs. Leaf entire, ovate, shallowly cordate, 7-10×5-8 cm. Cyme panicled; peduncle 2-4 cm long; bracts caducous. Sepals suborbicular, 0.6 cm across. Corolla funnel-shaped, pink with purplish tube, 2-2.5 cm long; limb shallowly lobed. Capsule ovoid, to 1 cm long.

India, Sri Lanka. Locally common near Arsikere Tank (eastern plain). December-March. *CJS* 11946, 16080.

MERREMIA Dennstedt ex Endlicher *nom. cons.*

Climbing but also erect or prostrate herbs or shrubs. Leaves simple to compound. Inflorescence pedunculate, 1-many-flowered cyme; bracts

short. Flowers usually yellow-white. Sepals subequal, accrescent or not. Corolla campanulate or funnel-shaped, mostly glabrous; limb subentire. Stamens often unequal; anthers usually twisted; pollen smooth. Disc prominent. Ovary 2 or 4-locular, 4-ovuled; style simple; stigma biglobular. Capsule dehiscing by 4 valves or irregularly.

1 Leaves palmately 5-7-lobed.....*M. vitifolia*
1 Leaves entire, crenate or 3-lobed.
2 Peduncle 0.5 cm long. Leaves as long as or broader than long.....*M. gangetica*
2 Peduncle more than 1 cm long. Leaves longer than broad.
3 Cyme umbellate, many-flowered. Leaf base not auricled or toothed....*M. umbellata*
3 Cyme not umbellate, 1-few-flowered. Leaf bases auriculate and toothed.....
.....*M. tridentata*

Merremia gangetica (L.) Cufod., Bull. Jard. Bot. Etat 31 (Suppl.): 743. 1961. *Convolvulus gangeticus* L. in Torner, Cent. II. Pl. 9. 1756. *Evolvulus emarginatus* N. Burman, Fl. Ind. 77, t. 30, f. 1. 1768. *Merremia emarginata* (N. Burman) H. Hallier, Bot. Jahrb. 16: 552. 1893; Gamble, Fl. Madras 928(652). 1923.

Slender, diffuse, pubescent herbs. Leaf minutely toothed, reniform-ovate, cordate, 1.5 × 1.5-2 cm, pale green beneath. Cyme short, sessile; bracts minute. Flowers small, shortly pedicelled. Sepals ciliate along the margin, outer 2 apiculate, inner 3 larger, emarginate, 0.4 cm long. Corolla campanulate, yellow, 0.7 cm long. Capsule subglobose.

Paleotropics. Frequent across the plain in marshes and cultivated fields. November-February. *CJS* 11359, 11960.

Merremia tridentata (L.) H. Hallier, Bot. Jahrb. 16: 552. 1893. *Convolvulus tridentatus* L., Sp. Pl. 157. 1753.

ssp. **hastata** (H. Hallier) Ooststr., Blumea 3: 317. 1939; in Steenis, Fl. Malesiana ser. 1, 4: 445. 1953. *Convolvulus hastatus* Desr. in Lam., Encycl. 3: 542. 1789, non Forskal, 1775. *Merremia hastata* H. Hallier, *l.c.*; Gamble, Fl. Madras 929(652). 1923.

Trailing herbs with thick rootstock and slender, diffuse branches. Leaves subsessile, ovate, linear-lanceolate, acute-mucronate, toothed on the auricles at base, 1-6 × 0.2-0.8 cm. Cyme 1-few-flowered; peduncle 1-8 cm long. Sepals lanceolate, apiculate, to 0.6 cm long. Corolla tubular, white, to 2 cm long. Capsule ellipsoid-globular, to 0.8 cm across.

Paleotropics. Scattered across the District. July-January. *CJS* 12124, 15858.

Note: Subspecies *tridentata* also occurs in S. India but has leaves and outer sepals obtuse-emarginate.

Merremia umbellata (L.) H. Hallier, Bot. Jahrb. 16: 552. 1893;

Gamble, Fl. Madras 928 (651). 1923. *Convolvulus umbellatus* L., Sp. Pl. 155. 1753.

Glabrous or silky pubescent, slender or woody climbers. Leaf subserrate, ovate-lanceolate, acuminate, cordate, 4-10×2-5 cm. Cyme umbellate, few-many-flowered; peduncle 1-4 cm long. Flowers distinctly pedicelled. Sepals ovate-lanceolate, obtuse and often apiculate, to 0.8 cm long. Corolla campanulate, white or cream-colored, 2.5-4 cm long, sparsely pubescent toward the tip. Capsule ovoid, mucronate, glabrous or pubescent, to 1 cm long.

Tropics. Scattered across the Ghats. January-April. *CJS* 16199, *HFP* 1309.

Merremia vitifolia (N. Burman) H. Hallier, Bot. Jahrb. 16: 552. 1893; Gamble, Fl. Madras 928(651). 1923. *Convolvulus vitifolius* N. Burman, Fl. Ind. 45, t. 18, f. 1. 1768.

Twiners with deciduous, fulvous hairs. Leaf ovate, cordate, digitately 5-7-lobed, 5-12×4-10 cm; lobes dentate, ovate, acuminate. Cyme few-flowered; peduncle 3-5 cm, long. Sepals ovate-lanceolate, obtuse and mucronate, to 2 cm long. Corolla campanulate, yellow, glabrous, 3-5 cm long. Capsule globose, to 1 cm across, yellow.

Indomalaysia. Common in lower Bisle Ghat. December-March. *CJS* 16199, *HFP* 1309.

RIVEA Choisy

Leaves simple, with 2 glands at the tip of the petiole. Cyme peduncled, 1-3-flowered; bracts narrow, short. Sepals subequal. Corolla salverform, pilose within; limb shallowly lobed. Staminal filaments short, hairy toward the base; pollen spinulose. Disc annular. Ovary 4-locular; ovule 1 per locule; stigmas 2, linear-oblong. Fruits subglobose, dry, indehiscent or irregularly dehiscent, apiculate.

Rivea hypocrateriformis (Desr.) Choisy, Mem. Soc. Phys. Geneve 6: 408. 1834; Gamble, Fl. Madras 903(635). 1923. *Convolvulus hypocrateriformis* Desr. in Lam., Encycl. 3: 561. 1792.

Grey-tomentose, climbing shrubs. Leaf reniform-ovate, cordate, shortly acuminate, to 4×5 cm. Peduncle usually sub-terminal, 1-3-flowered. Sepals oblong-lanceolate, obtuse, to 0.8 cm long. Corolla white, to 5 cm long. Fruits ovoid, brown, to 2 cm long.

India, Sri Lanka. Collected once at Ramanahalli (scrub) in flower on July 11, 1970. *HFP* 391.

Note: Flowers fragrant. Gamble (*l.c.*) notes that the flowers open at sunset and close at sunrise.

112. MENYANTHACEAE

T. P. Ramamoorthy

NYMPHOIDES Seguier

Aquatic herbs. Stem sometimes simulating a petiole. Leaves alternate, estipulate, simple, cordate, entire, palmately veined, with sheathing petioles. Inflorescence fasciculate, nodal or lateral on petiole-like stem below leaf blade. Flowers bisexual, usually 5-merous, regular. Sepals slightly connate at base, imbricate, persistent. Petals connate at base, valvate. Stamens epipetalous; anthers versatile. Disc of 5 nectariferous glands alternating with stamens, at the base of ovary. Ovary superior, 1-locular; ovules few-many, on 2-5 parietal placentas; style simple; stigma 2-3-fid. Fruit a 2-3-valved capsule or indehiscent or bursting irregularly. Seeds few-many.

1 Petals not fimbriate, glandular, crested with 3 longitudinal folds; seeds tuberculate ..... *N. cristata*

1 Petals wholly fimbriate, eglandular, not cristate; seeds smooth ..... *N. indica*

Nymphoides cristata (Roxb.) Kuntze, Rev. Gen. Pl. 429. 1891; Backer & Bakh. f., Fl. Java 2: 441. 1965. *Menyanthes cristata* Roxb., Pl. Cor. t. 105. 1798. *Limnanthemum cristatum* (Roxb.) Griseb., Gen. Sp. Gent. 342. 1839; Gamble, Fl. Madras 883(620). 1923.

Leaf to 10.7×8.5 cm, orbicular. Sepals oblong, rounded. Petals oblong, acute, with longitudinal folds along margin and the center, glandular below fold, white with yellow base. Fruit indehiscent, irregularly ellipsoid, enclosing few-many, tuberculate seeds.

Indomalaysia. Local in distribution, found in tanks at the foot-hills, below Nagpuri in eastern plains. July. *CJS* 13920.

Nymphoides indica (L.) Kuntze, Rev. Gen. Pl. 429. 1891; Backer & Bakh. f., Fl. Java 2: 441. 1965. *Menyanthes indica* L., Sp. Pl. 145. 1753. *Limnanthemum indicum* (L.) Griseb. emend. Thwaites, Enum. 205. 1860; Gamble, Fl. Madras 883(621). 1923.

Leaves 7-7.5×20-22 cm, orbicular. Sepals ovate-lanceolate, acute. Petals ovate-lanceolate, eglandular, densely fimbriate, white with yellow base. Fruit globose, bursting irregularly, enclosing many smooth seeds.

Indomalaysia. Common in tanks and pools, in plains and Ghats. All seasons. *CJS* 15723, *HFP* 1926.

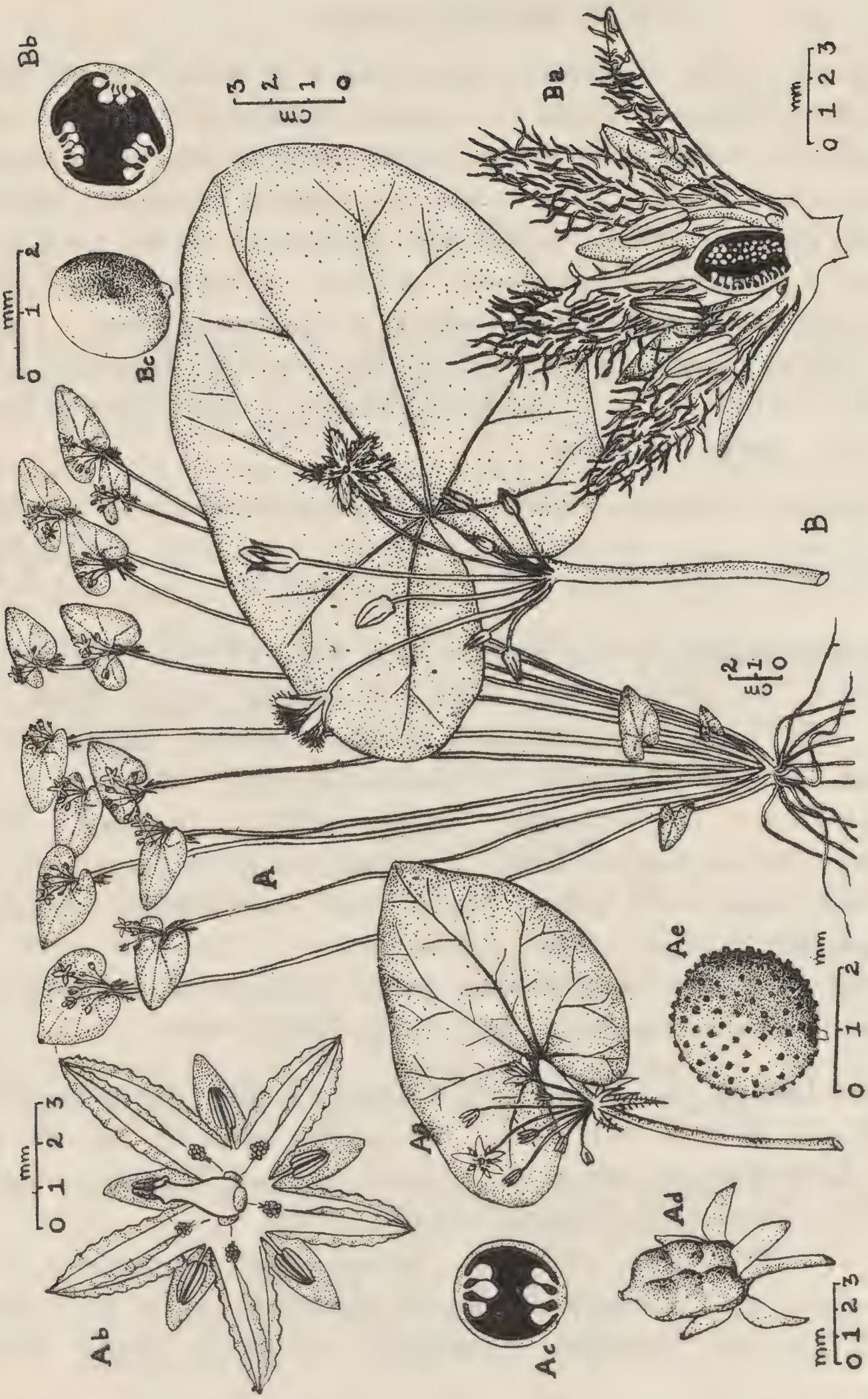


Fig. 90. MENYANTHACEAE. *A. Nymphoides cristata*: habit; *Aa*, flowering twig; *Ab*, flower; *Ac*, section of ovary; *Ad*, fruit; *Ae*, seed. *B. Nymphoides indica*: flowering twig; *Ba*, section of flower; *Bb*, section of ovary; *Bc*, seed.

113. BORAGINACEAE

T. P. Ramamoorthy

Note: Dr. J. Nowicke (U.S.) kindly shared her knowledge and manuscript on the Boraginaceae of Sri Lanka with the editors.

Leaves usually alternate, estipulate, simple, usually entire-crenate, usually pinnately veined. Inflorescence usually a coiled cincinnus; bracts foliaceous to 0. Flower bisexual, regular, usually 5-merous. Calyx usually lobed and imbricate; corolla lobed. Stamens epipetalous; connective sometimes produced. Disc inconspicuous, or none. Ovary superior, entire or 2-4-lobed, usually 2-4-locular, with a total of 4 sub-basal, axillary or apical ovules; style terminal or gynobasic, simple, once or twice branched; stigmas various. Fruit of 4 dry nutlets or drupaceous with 1-4 pyrenes.

1 Herbs.
2 Leaves dentate, oblique.....**Coldenia**
2 Leaves entire, symmetric.
3 Flowers more than 1 cm wide, long-pedicelled, solitary or in nonscorpioid racemes .....**Trichodesma**
3 Flowers less than 1 cm wide, sessile or short pedicelled, in scorpioid spikes or racemes.
4 Flowers racemose, remote; nutlets glochidiate.....**Cynoglossum**
4 Flowers spicate, crowded; nutlets smooth.....**Heliotropium**
1 Woody shrubs or trees.
5 Leaves less than 3 cm long, crowded on short lateral branches or fasciculate.
6 Leaves toothed or 3-lobed at apex; style branched below middle; endocarp entire; plants of dry places.....**Carmona**
6 Leaves entire; style unbranched; endocarp 4-lobed; plants of stream margins..**Rotula**
5 Leaves with at least some over 5 cm long, alternate to subopposite.
7 Style dichotomously twice-branched; endocarp unlobed.....**Cordia**
7 Style once-branched; endocarp 2-4-lobed.....**Ehretia**

CARMONA Cavanilles

Woody. Leaves fascicled, subsessile. Flower usually solitary. Ovary entire, 4-locular; style terminal, once branched near base; stigmas minute. Drupe with bony 4-seeded endocarp which remains entire.

Carmona retusa (Vahl) Masamune, Trans. Nat. Hist. Soc. Taiwan 30: 61. 1940; Backer & Bakh. f., Fl. Java 2: 459. 1965. *Cordia retusa* Vahl, Symb. Bot. 2: 42. 1791. *Ehretia microphylla* Lam., Ill. 1: 425. 1792; Gamble, Fl. Madras 891(626). 1923. *Carmona microphylla* (Lam.) G. Don, Gen. Syst. 4: 391. 1837; Johnston, J. Arnold Arbor. 32: 16. 1951.

Profusely branching shrubs to 1.5 m. Leaves 2-2.5×0.5-0.8 cm, ovate, 2-3-crenate at tip, with bulbous-based hairs. Flower pedicel to

Fig. 91. BORAGINACEAE. *A. Carmona retusa*: flowering branch; *Aa*, flower; *Ab*, ovary, cross section. *B. Cynoglossum zeylanicum*: gynoecium; *Ba*, fruit. *C. Cordia wallichii*: gynoecium. *D. Heliotropium ovalifolium*: flowering branch; *Da*, gynoecium. *E. Heliotropium bracteatum*: flower in vertical section; *Ea*. fruit. *F. Rotula aquatica*: flower; *Fa*, gynoecium. *G. Trichodesma zeylanicum*: flower.

0.8 cm. Calyx lobes spatulate, bristly hairy. Corolla white, campanulate; lobes broad below, acute at tip. Drupe globose, turning bright red, 4-seeded.

Indomalaysia. Common in deciduous forests and dry scrub jungle. All seasons. *CJS* 14669, *HFP* 23.

Note: The above nomenclature is based on the assumption that *Ehretia microphylla* Lam. was published in 1792. Some authors, however, consider it to have been published in Lam., Encycl. 2: 425. 1788.

COLDENIA Linnaeus

Prostrate herbs. Flowers usually extra-axillary, 4-merous, shortly pedicelled. Ovary shallowly 4-lobed; style terminal, short, bifid. Fruit dry, first breaking into 2-seeded halves, these finally breaking into 1-seeded nutlets.

Coldenia procumbens L., Sp. Pl. 125. 1753; Gamble Fl. Madras 892(627). 1923.

White-hairy annuals. Leaves to 1.3×0.8 cm. obovate-oblong, oblique, cuneate, crenate-crisped. Flowers minute. Calyx lobes ovate, persistent. Corolla white, with spreading limb.

Pantropical. Common weed in dry tank beds and harvested fields. November-May. *CJS* 11365, 13465.

CORDIA Linnaeus

Woody. Cymes axillary, corymbiform. Flower bisexual or functionally unisexual. Calyx persistent or accrescent. Stamens exserted; filaments often hairy at base. Ovary entire; style terminal, twice branched; stigmas 4. Drupe with 1-4-seeded, bony endocarp.

1 Leaves rounded, cuneate at base, hardly hairy beneath; peltate scales numerous; calyx ribbed ..... *C. evolutior*
1 Leaves usually cordate at base, brown-tomentose beneath; peltate scales absent; calyx not ribbed ..... *C. wallichii*

Cordia evolutior (C. B. Clarke) Gamble, Fl. Madras 888(624). 1923.

Cordia fulvosa var. *evolutior* C. B. Clarke in J. Hooker, Fl. Brit. India 4: 140. 1883.

Tree to 17 m. Leaves 7-13×4-6 cm, ovate-oblanceolate, acute, cuneate, with numerous peltate scales. Flowers white. Calyx ribbed, tubular, margins recurved in fruit. Fruit turning yellow.

S. India. Common in deciduous forests at Bagi, Hebbsale in upper Ghats and Maranahalli in Shiradi Ghat. April. *CJS* 13255, *HFP* 1584, 2789.

Cordia wallichii G. Don, Gen. Syst. 4: 379. 1837; Bedd., Fl. Sylv. 249. 1872; Gamble, Fl. Madras 887(624). 1923. *Cordia tomentosa* Wall. in Roxb., Fl. Ind. 2: 339. 1824, non Roemer & Schultes, 1819. *Cordia obliqua* auct. non Willd., 1798: Wight, Ic. t. 1378. 1848. *Cordia obliqua* var. *wallichii* (Don) C. B. Clarke in J. Hooker, Fl. Brit. India 4: 137. 1883.

Deciduous trees to 4-5 m. Leaves to 14×13 cm, ovate-orbicular, acute, stellately brown-tomentose below, glabrous with age above, palmately 3-ribbed from base. Flowers white. Calyx smooth, margins not recurved in fruit.

Pakistan, Western India. Common in dry deciduous forests in western plains. March-April. *CJS* 14157, 16732, *HFP* 1586.

Note: Kazmi (in *J. Arnold Arbor.* 51: 140 ff. 1970) calls this plant *C. obliqua* Willd. var. *tomentosa* (Wall.) Kazmi.

CYNOGLOSSUM Linnaeus

Herbs. Leaves entire, the basal often long-petioled. Cincinnus with flowers ultimately distant. Calyx persistent. Corolla lobes spreading, imbricate, with scales at the throat. Ovary 4-lobed, sessile on flat receptacle, 4-locular; ovules horizontal; style gynobasic; stigma obscure. Nutlets glochidiate. Fruiting calyx shorter than nutlets.

Cynoglossum zeylanicum (Hornem.) Thunb. ex Lehm., Neue Schriften Naturf. Ges. Halle 3(2): 20. 1817; Kazmi, J. Arnold Arbor. 52: 344. 1971. *Anchusa zeylanica* Vahl ex Hornem., Enum. Hafn. 3. 1807. *Cynoglossum denticulatum* var. *zeylanicum* (Hornem.) C. B. Clarke in J. Hooker, Fl. Brit. India 4: 157. 1883; Gamble, Fl. Madras 900(632). 1923. *Cynoglossum furcatum* Wall. in Roxb., Fl. Ind. 2: 6. 1824; Gamble, Fl. Madras 900(632). 1923. *Cynoglossum meeboldii* Brand, Feddes Repert. Spec. Nov. Regni Veg. 14: 323. 1916.

Leaves 6-9×2-4 cm, ovate, acute at both ends. Calyx lobes ovate, bristly hairy. Corolla lobes rounded, spreading, white with a blue tinge.

S. India, Sri Lanka. Common in open country and along roadsides. All seasons. *CJS* 9206, 13870, *HFP* 732, 2111.

Note: Kazmi (*l.c.*) distinguishes *C. zeylanicum* from *C. lanceolatum* Forskal by the shorter, nonbulbous-based hairs, but we find gradations. Our identification is tentative.

EHRETIA Linnaeus

Woody. Leaves entire. Corolla lobes often recurved. Stamens exserted. Ovary entire; style terminal, once branched above middle; stigmas capitate. Drupe with 4 or fewer pyrenes.

Ehretia canarensis (C. B. Clarke) Gamble, Fl. Madras 891(626). 1923.

Ehretia laevis var. *canarensis* C. B. Clarke in J. Hooker, Fl. Brit. India 4: 142. 1883.

Tree to 8 m. Leaves to 11×4.5 cm, lanceolate-oblanceolate, acuminate, cuneate to rounded at base, usually symmetrical. Calyx lobes small, ovate, campanulate. Corolla white; lobes ovate, acute to rounded, with recurved margins, reflexed. Fruit fleshy, indehiscent, 4-seeded.

South W. India. Common in semi-evergreen forests in Ghats. October-August. *CJS* 15519, *HFP* 850, 921.

HELIOTROPIUM Linnaeus

Herbs with lower leaves often opposite. Inflorescence of scorpioid cymes. Calyx lobes usually unequal. Corolla tube constricted near throat with the lobes spreading. Anthers often apiculate and connivent by tips. Ovary 4-locular; style sometimes none, usually orginating in a fleshy annular ring; stigma conical. Fruit dry, splitting into four 1-seeded or two 2-seeded nutlets.

1 Anthers connivent by their tips.
2 Bracts large, foliaceous.....*H. bracteatum*
2 Bracts inconspicuous.....*H. marifolium*
1 Anthers not connivent by their tips.
3 Style none; nutlets all separating.....*H. ovalifolium*
3 Style present; nutlets separating in pairs.....*H. indicum*

Heliotropium bracteatum R. Br., Prodr. 493. 1810; Gamble, Fl. Madras 898(630). 1923.

Erect herbs, white-hairy. Leaves to 3×0.8 cm, elliptic-oblong, cuneate, entire. Bracts foliaceous. Flower white. Anther tips produced. Style short; stigma pubescent. Fruit of equal nutlets.

Indomalaysia, Australia. Common, in dry, rocky or sandy terrain in the eastern plains at Nagpuri. June-August. *CJS* 13843, *HFP* 1937.

Heliotropium indicum L., Sp. Pl. 130. 1753; Gamble, Fl. Madras 897(630). 1923.

Erect herbs to 40 cm. Leaves 3-8.5×1.5-6 cm, ovate-orbicular, usually contracted into partially winged petiole, crenate. Cincinnus elongate; flowers blue-white, in 2 series. Anthers free. Style 0.5-0.7 mm. Fruit deeply 2-fid, each lobe finally dividing into 1-seeded nutlets.

Pantropical. Common in Ghats in moist rice fields, sandy river beds, along the banks of streams. April-July. *CJS* 16942, *HFP* 1638.

Heliotropium marifolium Retz., Obs. Bot. 2: 8. 1810; Backer & Bakh. f., Fl. Java 2: 462. 1965; Riedl in Rechinger, Fl. Iran. 48:

16. 1967. *Heliotropium scabrum* Retz., Obs. Bot. 2: 8. 1810; Gamble, Fl. Madras 898(630). 1923.

Note: Johnston (*J. Arnold Arbor.* 32: 113. 1951) remarks that the plants are at first erect but later usually depressed. We follow Backer and Riedl in synonymizing *H. scabrum*.

1 Prostrate spreading herbs.....var. *marifolium*
1 Erect herbs.....var. *wallichii*

var. **marifolium**

Prostrate, compact, spreading, strigose herbs. Leaves to 1.2×0.2 cm, lanceolate-elliptic, cuneate, entire; venation indistinct. Scorpioid cyme to 3 cm. Flowers white. Anthers apiculate, connivent by tips style 0.2-0.3 mm; stigma conical. Fruit of 4 equal nutlets.

Indomalaysia. Common, in dry-sandy terrain in the plains. December-August. *CJS* 10651, 14506, *HFP* 1932.

var. **wallichii** C. B. Clarke in J. Hooker, Fl. Brit. India 4: 152. 1883; Wight, Ic. t. 1390. 1848. *Heliotropium scabrum* var. *wallichii* (C. B. Clarke) Gamble, Fl. Madras 897(630). 1923.

Erect, small herbs. Leaves to 1.5×0.4 cm, oblong, acute at both ends, entire, hairy. Flowers white.

South W. India. Rare; collected only once from sandy-rocky terrain, in open country, along Halebid-Belur road. September. *CJS* 15026.

Note: Kazmi (*J. Arnold Arbor.* 51: 133-184. 1970) raises the variety to the rank of subspecies.

Heliotropium ovalifolium Forskal, Fl. Aegypt.-Arab. 38. 1775; Gamble, Fl. Madras 896(629). 1923. *Heliotropium coromandelianum* Retz., Obs. Bot. 2: 9. 1810; Wight, Ic. t. 1388. 1848.

Erect herbs, usually branching from base, white-hairy. Leaves 1-4× 0.6-1.5 cm, elliptic-obovate or oblanceolate, rounded-obtuse at apex, entire. Flowers in elongate inflorescences, commonly paired, white. Anthers free. Stigma sessile. Fruit breaking into 4 equal nutlets.

Old World Tropics. Common in fallow rice fields and along roadsides in western plains. February-August. *CJS* 16300, *HFP* 1437.

ROTULA Loureiro

Leaves entire, often fasciculate. Inflorescence a few-flowered cyme. Stamens exserted. Ovary entire, 2-locular but each locule almost completely 2-locellate; style terminal, persistent; stigma capitate. Drupe with endocarp strongly 4-lobed and soon breaking into four 1-seeded pyrenes.

Rotula aquatica Lour., Fl. Cochinch. 121. 1790; Gamble, Fl. Madras 893(627). 1923. *Ehretia cuneata* Wight, Ic. t. 1385. 1848.

Trailing shrubs. Leaves to 2 × 0.8 cm, oblong-oblanceolate, apiculate. Flowers pink to purple. Drupe globose, tipped by persistent 4-5 mm style.

India, S. E. Asia. Common on sandy-pebbly banks of rivers. October. *CJS* 15414, *HFP* 1043.

Note: Some workers (Johnston, *J. Arnold Arbor.* 32: 15. 1951) regard the African and Brazilian collections of this taxon as representing a distinct species, *R. lycioides* (Mart.) Johnst.

TRICHODESMA R. Brown *nom. cons.*

Herbs. Leaves alternate or opposite, entire, with bulbous-based white hairs on the upper surface. Flowers usually solitary, becoming racemose by reduction of leaves. Calyx accrescent in fruit. Corolla tube short; limb spreading. Anthers connate into a cone; connectives produced and often twisted around each other. Ovary 4-lobed, 4-locular; style subterminal, slender; stigma small. Nutlets 4, all adnate by their inner surface to central, pyramidal receptacle.

1 Calyx lobes hastate below; flowers white..... *T. indicum*
1 Calyx lobes not hastate below; flowers blue..... *T. zeylanicum*

Trichodesma indicum (L.) Lehmann, Pl. Fam. Asperif. 193. 1818 ('*indica*'); Gamble, Fl. Madras 899(631). 1923. *Borago indica* L., Sp. Pl. 137. 1753.

Erect, hispid herbs to 0.4 m. Leaves opposite, sessile, amplexicaul, to 5.5 × 0.8 cm, oblong-lanceolate. Flower solitary. Calyx lobes ovate, acuminate, hastate. Corolla white, lobes rounded, apiculate. Anthers bearded below; connectives produced and twisted. Nutlets smooth.

Afghanistan, India, Mauritius. Common, in plains in open country, along roadsides and in fallow fields. July-December. *CJS* 11975, 15335.

Note: Kazmi (*J. Arnold Arbor.* 52: 516. 1971) recognizes *T. indicum* var. *amplexicaule* (Roth) Cooke, with subcordate to subamplexicaul, cauline leaves. The binomial *T. indicum* is commonly attributed to R. Brown (*Prodr.* 496. 1810) but he only stated that *Borago indica* belonged to *Trichodesma* and did not actually make the combination (Art. 33).

Trichodesma zeylanicum (N. Burman) R. Br., Prodr. 496. 1810 ('*zeylanica*'); Gamble, Fl. Madras 899(632). 1923. *Borago zeylanica* N. Burman, Fl. Ind. 41. 1768.

Erect, hispid herbs. Leaves opposite, shortly petioled, to 10 × 2.5 cm, elliptic-lanceolate, with bulbous-based hairs. Flower generally solitary, drooping; upper ones in leafy racemes. Calyx lobes ovate, acuminate, entire below. Corolla blue with rounded, apiculate lobes. Anthers bearded below; connectives produced and twisted. Nutlets smooth.

India to Australia. Common in plains and upper Ghats, in open country and along roadsides. December-August. *CJS* 15735, 16312.

114. VERBENACEAE

K. N. Gandhi

Branches usually quadrangular. Leaves opposite or whorled; stipules 0; blade usually simple; venation usually pinnate. Inflorescence bracteate. Flowers bisexual, usually irregular, 4-5(-6)-merous. Calyx toothed or lobed, usually persistent. Corolla gamopetalous, usually salverform; tube erect or curved; lobes usually equal. Stamens usually 4, epipetalous, equal or didynamous; staminodes 1-2 or 0. Ovary superior, often lobed, usually 2-locular with 2 axillary ovules per locule; style simple, terminal; stigma usually entire. Fruit usually drupaceous; seeds 1-8.

1 Leaves digitately 3-7-foliolate.....**Vitex**
1 Leaves simple.
2 Large trees over 20 m. Leaves and inflorescence very large (more than 40 cm long). Fruiting calyx much inflated.....**Tectona**
2 Herbs, shrubs or small trees (less than 12 m). Leaves and inflorescence less than 30 cm. Fruiting calyx only slightly accrescent.
3 Inflorescence subtended by a whorl of 6, foliaceous, accrescent bracts. Stamens 6 or more.....**Symphorema**
3 Inflorescence without whorl of bracts. Stamens 4 or less.
4 Flowers sessile or subsessile (pedicels less than 2 mm).
5 Inflorescence cymose, centrifugal.....**Callicarpa**
5 Inflorescence a cylindric or capitate spike, centripetal.
6 Spike more than 15 cm long (excluding peduncle). Stamens 2..**Stachytarpheta**
6 Spike less than 15 cm long. Stamens 4.
7 Creeping herbs. Fruits dry.....**Phyla**
7 Shrubs. Fruits fleshy.....**Lantana**
4 Flowers pedicelled (pedicels more than 5 mm).
8 Inflorescence racemose, centripetal.....**Duranta**
8 Inflorescence cymose, centrifugal.
9 Calyx with 2-7 glands on the anterior part. Corolla limb distinctly 2-lipped .....**Gmelina**
9 Calyx without any glands. Corolla limb slightly oblique.
10 Exserted part of stamens over 1 cm long. Pyrenes 1-4, each 1-seeded..... .....**Clerodendrum**
10 Stamens not much exserted. Pyrene one, 4-seeded.....**Premna**

CALLICARPA Linnaeus

Arborescent, stellately tomentose shrubs. Leaves minutely serrate. Inflorescence a paniculate cyme, centrifugal, axillary, smaller than leaves; bracts linear or lanceolate. Flowers 4-merous, subsessile. Calyx

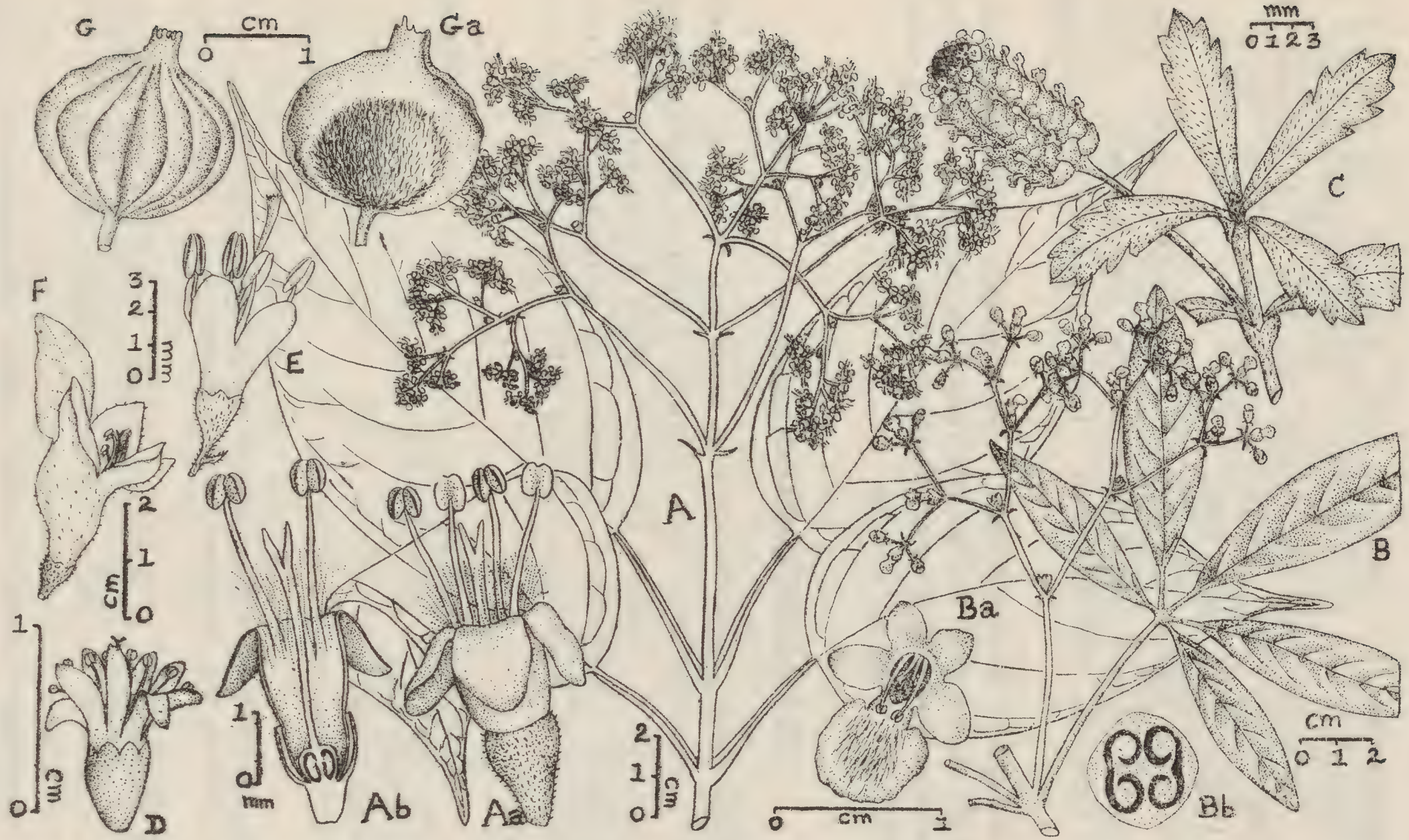


Fig. 92. VERBENACEAE. *A. Premna coriacea*: flowering twig; *Aa*, flower; *Ab*, same in section. *B. Vitex leucoxylon*: flowering twig; *Ba*, flower; *Bb*, ovary in section. *C. Phyla nodiflora*: flowering twig. *D. Symphorema involucratum*: flower. *E. Callicarpa tomentosa*: flower. *F. Gmelina arborea*: flower. *G. Tectona grandis*: fruit enclosed in calyx; *Ga*, same, showing drupe.

cupular, truncate to dentate. Corolla tube short. Stamens equal, exserted; anther cells gland-dotted. Ovary imperfectly 2-locular, finally 4-locular; style elongate, dilated at apex, obscurely 2-fid. Drupe globular, black, small; pyrenes 4, each 1-seeded.

Callicarpa tomentosa (L.) Murray, Syst. Veg. ed. 13, 130. 1774; Sant., Fl. Khandala ed. 3, 212. 1967. *Tomex tomentosa* L., Sp. Pl. 118. 1753. *Callicarpa lanata* L., Mant. Alt. 331. 1771; Gamble, Fl. Madras 1092(764). 1924. *Callicarpa wallichiana* Walp., Rep. 4: 125. 1845; Wight, Ic. t. 1480. 1849.

Petioles 5-8 cm long; blades elliptic-ovate, acuminate-caudate, acute-rounded at base, to 20×15 cm, hirsute on the nerves above, densely white-tomentose beneath, subcoriaceous. Cymes opposite, 3-5 cm long. Corolla purple.

South India. Frequent in the Ghats. All seasons. *CJS* 12063.

Note: J. Hooker (*Fl. Brit. India* 4: 567-68. 1885) notes that this taxon much resembles *C. arborea* Roxb., and *C. hookeri* C. B. Clarke. Moldenke (*Fifth Summary of the Verbenaceae* ....409. 1971) reduces the latter to *C. vestita.*

CLERODENDRUM Linnaeus

Shrubs or small trees. Inflorescence a panicled cyme or corymb, centrifugal; bracts conspicuous or not. Flowers 5-merous, slightly irregular. Calyx campanulate, toothed or lobed, often accrescent. Corolla limb slightly 2-lipped. Stamens 4, didynamous, long-exserted. Ovary imperfectly 4-locular; style elongate; stigma bifid. Drupe 4-lobed, with four 1-seeded pyrenes.

1 Leaves shallowly lobed; stem nodes hairy.....*C. paniculatum*
1 Leaves entire or only serrate; stem nodes not hairy.
2 Inflorescence an axillary cyme.....*C. inerme*
2 Inflorescence a terminal panicle.
3 Flowers double.....*C. philippinum*
3 Flowers simple.
4 Leaves cordate, tomentose beneath. Calyx deeply divided to the base..*C. viscosum*
4 Leaves neither cordate nor tomentose. Calyx truncate.....*C. serratum*

Clerodendrum inerme (L.) Gaertner, Fruct. 1: 271. 1788; Gamble, Fl. Madras 1099(769). 1924. *Volkameria inermis* L., Sp. Pl. 637. 1753.

Glabrescent, straggling shrubs. Leaves entire, obovate-ovate, obtuse at apex, cuneate, to 3×2 cm, chartaceous, glandular. Cyme axillary, occasionally terminal, 3-flowered; peduncle to 2 cm long; bracts minute; pedicels to 1 cm long. Calyx small, dentate. Corolla salverform, white; tube 2.5-4 cm long; limb oblique; lobes 6, short, spreading. Drupe brown.

India, Sri Lanka. Occasional in plains. August-November. *CJS* 8734, 15340.

Clerodendrum paniculatum L., Mant. 90. 1767 ('*paniculata*'); C. B. Clarke, in J. Hooker, Fl. Brit. India 4: 593. 1885; Backer & Bakh. f., Fl. Java 2: 609. 1965.

Glabrescent undershrubs; nodes hairy. Leaf shallowly lobed, minutely denticulate, ovate, shortly apiculate, cordate, to 20 cm across, membranous, glandular beneath; venation subpalmate, 5-ribbed. Panicle terminal, lax; bracts conspicuous. Pedicels slender, 1-1.5 cm long. Calyx deeply lobed. Corolla glabrous, scarlet; tube narrow, 2 cm long; lobes 5-6, spreading, elliptic-ovate, glandular.

Indomalaysia. Frequent escape in upper Ghats. May-August. *CJS* 10962, 13681.

Clerodendrum philippinum Schauer in DC., Prodr. 11: 667. 1847 ('*Clerodendron*'); Howard & Powell, Taxon 17: 54. 1968. *Volkamannia japonica* Jacq., Hort. Schoenbr. 3: 48, t. 338. 1798 [non *Clerodendrum japonicum* (Thunb.) Sweet, 1827, based on *Volkameria japonica* Thunb., 1784]. *Volkameria fragrans* Vent., Jard. Malm. 2: t. 70. 1804. *Clerodendrum fragrans* [Hort. ex. Vent., *l.c.* pro syn. *Volkameria fragrans* Vent.] Willd., Enum. Hort. Berol. 659. 1809; Aiton, Hort. Kew. 4: 63. 1812; Gamble, Fl. Madras 1100(770). 1924, *nom. superfl. et illeg.* *Clerodendrum fragrans* var. *multiplex* Sweet, Hort. Brit. 322. 1827. *Clerodendrum fragrans* var. *pleniflorum* Schauer, *l.c.* 666; Sant., Fl. Khandala ed. 3, 215. 1967. *Clerodendrum japonicum* var. *pleniflorum* (Schauer) Maheswari, Taxon 15: 43. 1966.

Young parts pubescent. Leaf remotely toothed along the margin, broadly ovate, shortly acuminate, rounded-acute, to 14 × 10 cm, pubescent along the nerves beneath, chartaceous. Panicle corymbose, terminal, to 10 cm across, dense. Calyx divided to middle; segments 5-8, to 0.6 cm long, acuminate. Corolla with numerous segments, white-pink, glabrous. Stamens and ovary absent.

Eastern Asia. Cultivated in gardens for the scented flowers and occasionally escaping. All seasons. *CJS* 15046.

Note: As Howard & Powell (*l.c.*) pointed out, *Volkameria japonica* Thunb. (1784) is a different, single-flowered species not referrable to this taxon. *Volkamannia japonica* Jacq. (1798) is this double-flowered taxon, but the logical combination, *Clerodendrum japonicum* (Jacq.) *comb. nov.* cannot be made without creating a later homonym of *Clerodendrum japonicum* (Thunb.) Sweet (1827). Unfortunately, the well-known binomial, *Clerodendrum fragrans* Willd. (1809), cannot be used because it is a superfluous renaming of *Volkamannia japonica* Jacq., the epithet of which, being available at that time, ought to have been adopted in *Clerodendrum*. The single-flowered variant is known as *Clerodendrum philippinum* var. *simplex* Moldenke (*Phytologia* 20: 338. 1970).

Clerodendrum serratum (L.) Moon, Cat. 46. No. 382. 1824; Spreng.,

Syst. 2: 758. 1825; Wight, Ic. t. 1472. 1849; Gamble, Fl. Madras 1100(770). 1924. *Volkameria serrata* L., Mant. 90. 1767.

var. **dentatum** H. J. Lam, Verb. Malay Archipel. 269. 1919.

Sparsely pubescent herbs or shrubs; branches sometimes terete. Leaves sharply serrate, obovate, acuminate, cuneate and entire at base, to 20×10 cm, coriaceous. Panicle densely pubescent, to 20 cm long; bracts conspicuous. Pedicels to 0.3 cm long. Calyx campanulate, dentate. Corolla bluish-purple; tube 1 cm long; lobes longer than tube, subequal. Drupe purple.

India, Sri Lanka. Frequent across the District. May-September. *CJS* 14382, 17960.

Note: We are greatful to Dr. Moldenke for the determination.

Clerodendrum viscosum Vent., Jard. Malm. 1: t. 25. 1803; Sant., Fl. Khandala ed. 3, 214. 1967. *Clerodendrum infortunatum* auct. non L.: Wight, Ic. t. 1471. 1849 ('*infortunata*'); Gamble, Fl. Madras 1100(770). 1924.

Softly tomentose shrub or small trees; branches acutely quadrangular towards apex. Leaf entire, ovate, shortly acuminate, cordate, to 16×12 cm, thickly chartaceous; venation subpalmate, 5-ribbed. Panicle terminal, lax, to 20 cm long; bracts inconspicuous. Pedicels to 2 cm long, bracteolate at middle. Calyx segments divided to the base, ovate, acuminate. Corolla white, to 2 cm long; lobes lanceolate, subequal, spreading.

Indomalaysia. Frequent in Ghats. All seasons. *HFP* 428, 1354.

DURANTA Linnaeus

Shrubs. Racemes in the upper axils, appearing panicled; bracts conspicuous. Flowers subirregular, pedicelled. Calyx tubular, truncate-toothed, grooved in flower, accrescent and fleshy in fruit. Corolla lobes oblique or equal. Stamens 4, didynamous; filaments short. Ovary globular, 8-locular, 8-ovuled; style short; stigma obscurely 4-fid. Drupe enclosed in the calyx, fleshy, with four 2-seeded pyrenes.

Duranta repens L., Sp. Pl. 637. 1753; Sant., Fl. Khandala ed. 3, 215. 1967.

Pubescent stragglers with or without spines; branches terete. Leaves elliptic-ovate, acute at apex, cuneate and entire at base, to 6×2.5 cm, chartaceous. Fleshy calyx orange or yellow. Corolla violet, occasionally white, pubescent, to 1.5 cm long.

Introduced from South America. Fairly common as a hedge in upper Ghats. Sometimes an escape. All seasons. *CJS* 13387, 13792A.

GMELINA Linnaeus

Shrubs or trees, sometimes armed. Leaf venation subpalmate, 5-7-ribbed. Inflorescence a paniculate cyme, centrifugal, pedunculate or sessile, axillary; bracts small. Flowers irregular, pedicelled, 4-5-merous. Calyx small, campanulate, dentate, with 2-6 glands in the anterior portion. Corolla campanulate; tube dilated above; limb 2-lipped; upper lip 3-lobed with middle lobe larger; lower lip 2-lobed. Stamens 4, didynamous, slightly exserted from the corolla tube; filaments with glandular hairs; anthers attached toward apex. Ovary 4-locular; stigma subentire. Drupe fleshy, obovate with a 2-4-locular pyrene.

Gmelina arborea Roxb., Hort. Beng. 46. 1814; Pl. Cor. t. 246. 1815; Wight, Ic. t. 1470. 1849; Bedd., Fl. Sylv. t. 253. 1872; Robinson, Philipp. J. Sci. 7: 414. 1912; Gamble, Fl. Madras 1097(768). 1924.

Deciduous, unarmed trees to 12 m; young parts tomentose. Petiole to 7 cm long; blade entire, ovate, acuminate, subcordate and slightly decurrent at base, to 15×12 cm, chartaceous. Calyx lobes 5. Corolla to 4 cm long, brownish yellow, pubescent; tube to 1.5 cm long. Drupe to 1×2 cm, turning yellow with age.

Indomalaysia. Frequent in Shiradi Ghat. January-April. *CJS* 12824, 16581.

LANTANA Linnaeus

Usually scabrous shrubs, armed or not. Leaves crenulate along the margin. Inflorescence an axillary, centripetal, subcapitate or cylindrical spike; bracts distinct. Flowers 4-5-merous, small. Calyx membranous, tubular, truncate-dentate. Corolla salverform, often pubescent; lobes spreading, subequal. Stamens 4, didynamous. Ovary globular, 2-locular, 2-ovulate; style short; stigma thickened. Drupe with two 1-seeded pyrenes or one 2-seeded pyrene.

1 Bracts lanceolate, 3-5-nerved; corolla pink (red) to yellow, not white; plants usually armed ..... *L. camara*

1 Bracts ovate, 5-7-nerved; corolla pink to pale purple or white; plants usually unarmed ..... *L. indica*

Lantana camara L., Sp. Pl. 627. 1753.

var. **aculeata** (L.) Moldenke, Torreya 34: 9. 1934; Sant., Fl. Khandala ed. 3, 211. 1967. *Lantana aculeata* L., Sp. Pl. 627. 1753; Gamble, Fl. Madras 1087(761). 1924.

Rambling shrubs with short, recurved prickles. Leaves opposite, ovate, acuminate, cordate-acute at base, pubescent, to 7×4 cm. Spikes

corymbose-umbellate; peduncles to 6 cm long; bracts lanceolate, 3-5-nerved. Corolla pink, red or yellow, pubescent outside.

Introduced from Trop. America. Fairly common in disturbed areas. All seasons. Plants aromatic, very troublesome and spreading rapidly. *CJS* 15138, 17854.

Lantana indica Roxb., [Hort. Beng. 46. 1814, *nom.*] Fl. Ind. 3: 89. 1832; Wight, Ic. t. 1464. 1849; Gamble, Fl. Madras 1087(761). 1924.

1 Leaves acute-acuminate, 3-8 cm long; lower bracts acuminate; corolla pink-purple .....var. *indica*

1 Leaves obtuse, to 2 cm long; lower bracts acute or apiculate; corolla white..var. *albiflora*

var. **indica**

Erect, unarmed, sparsely pubescent shrubs. Leaves opposite, ovate, acute at apex, rounded-cordate and decurrent at base, to 8×4 cm, with dense, appressed, white pubescence beneath. Spikes cylindrical, 1-3 cm long; bracts foliaceous, ovate, acuminate, 7-nerved. Corolla pink to pale purple.

Trop. Africa, South Asia. Common across plain. June-October. *CJS* 14068, *HFP* 176.

var. **albiflora** Wight ex C. B. Clarke in J. Hooker, Fl. Brit. India 4: 562. 1885. *Lantana wightiana* Wall. ex Gamble, Fl. Madras 1087(760). 1924.

Leaves ovate-orbicular, rounded at apex, to 2 cm long. Spike 0.5 cm long, slightly elongating in fruit; lower bracts ovate-apiculate, 5-7-nerved. Corolla white.

South India. Common at Belvathally (scrub). May-September. *CJS* 13828, 17908.

Note: A few collections (*CJS* 14068, *HFP* 2830) intergrade between *L. indica* var. *indica* and *L. indica* var. *albiflora* probably due to hybridization.

PHYLA Loureiro

Slender herbs. Inflorescence a terminal cylindrical, short, centrifugal spike; bracts imbricate, small. Flowers 4-5-merous, irregular, sessile, dense, very small. Calyx deeply bipartite or lobed. Corolla 2-lipped; upper lip rounded or emarginate; lower lip 3-lobed, middle lobe larger. Stamens 4, didynamous, short. Ovary globular, 2-locular, 2-ovuled; style short; stigma capitate. Fruit dry, enclosed by calyx, breaking up into 2 cocci.

Phyla nodiflora (L.) Greene, Pittonia 4: 46. 1899; Sant., Fl. Khandala ed. 3, 211. 1967. *Verbena nodiflora* L., Sp. Pl. 20. 1753. *Lippia nodi-*

flora (L.) Michaux, Fl. Bor. Amer. 2: 15. 1803; Wight, Ic. t. 1463. 1849; Gamble, Fl. Madras 1088(762). 1924; Adams, Fl. Pl. Jamaica 630. 1972.

Slender, diffuse herbs, often rooting at lower nodes. Leaves obovate, coarsely serrate toward apex, to 1.5 × 0.6 cm. Spike usually solitary, 1-2 cm long; peduncle 4 cm long. Corolla white, tinged with purple.

Tropics. Frequent near water on the plains. All seasons. *CJS* 13701, *HFP* 1858.

Note: Some workers have concluded that Richard is the author and Michaux the editor of *Fl. Bor. Amer.* but Michaux regarded the work as his and Richard's name does not appear in it.

PREMNA Linnaeus *nom. cons.*

Climbing shrubs or small trees. Cyme terminal, paniculate, centri-, fugal; bracts small. Flowers irregular, pedicelled. Calyx cupular 2-lobed or sinuately 3-5-dentate, slightly enlarged in fruit. Corolla limb oblique, 2-lipped and 5-lobed or subequally 4-lobed. Stamens 4, subdidynamous; anther cells parallel or divergent. Ovary 2-locular or becoming 4-locellate, 4-ovuled; stigma shortly bifid. Drupe inside calyx, with a single, 4-seeded pyrene.

Premna coriacea C. B. Clarke in J. Hooker, Fl. Brit. India 4: 573. 1885; Gamble, Fl. Madras 1095(766). 1924.

Shrubby climber with purplish enations. Leaves rarely ternate toward apex; blade entire, elliptic-ovate, caudate, truncate at base, to 20 × 11 cm, subcoriaceous, shining above, pubescent on nerves beneath; nerves 5-7 pairs, prominent below. Panicle corymbose, 10 cm across, pubescent. Calyx 5-toothed. Corolla white. Drupe ovoid.

South India. Frequent in upper Ghats. March-May. *CJS* 16840, *HFP* 2712.

Premna tomentosa Willd., Sp. Pl. 3: 314. 1800; Wight, Ic. t. 1468. 1849; Bedd., Fl. Sylv. t. 251. 1872; Gamble, Fl. Madras 1095(767). 1924. *Cornutia corymbosa* Lam., Encycl. 1: 54. 1783, non N. Burman, 1768.

Erect shrubs or small trees with enations stellately yellow-tomentose. Leaves ovate, acuminate, subcordate, to 12 × 7 cm, thickly chartaceous. Panicle pyramidal, to 8 × 6 cm. Calyx 5-toothed. Corolla white outside, yellow within; throat hairy; lobes unequal. Drupe subglobose.

South India, Sri Lanka. Locally common at Belvathalli. March-May. *CJS* 11653, *HFP* 140.

Note: Moldenke (*Fifth Summary of the Verbenac.* 611. 1971) cites *Premna tomentosa* Willd. as a synonym of *Premna odorata* Blanco (1837). This may be because Willdenow

(*l.c.*) cites *Cornutia corymbosa* Lam. (1783) in synonymy, apparently rendering Willdenow's name superfluous and illegitimate. However, *Cornutia corymbosa* Lam. is already illegitimate, being a later homonym of *Cornutia corymbosa* N. Burman (1768).

STACHYTARPHETA Vahl *nom. cons.*

Large herbs or shrubs, sometimes subscandent. Leaves dentate. Inflorescence a terminal, centripetal spike. Flowers sessile and subtended by persistent bracts or immersed in the rachis and ebracteate, 4-merous. Calyx tubular, ribbed, dentate. Corolla salverform; tube slightly curved, hairy inside; limb oblique, with spreading, often emarginate lobes. Stamens 2. Staminodes 0-2, linear, small. Ovary 2-locular, 2-ovulate; style elongate, persisting; stigma subcapitate. Drupe included in calyx, breaking into two 1-seeded pyrenes.

1 Spike villous, 1 cm across.....*S. mutabilis*
1 Spike glabrescent, 0.5 cm across.....*S. indica*

Stachytarpheta indica (L.) Vahl, Enum. Pl. 1: 206. 1804; Gamble, Fl. Madras 1090(763). 1924. *Verbena indica* L., Syst. Nat. ed. 10, 851. 1759.

Subscandent, sparsely pubescent undershrubs. Leaves similar to that of following species. Spike to 30 cm long. Corolla blue-purple; limb to 0.8 cm across.

Trop. America, naturalized in tropical parts of Asia. Frequent across plains. All seasons. *CJS* 8854, *HFP* 1714.

Note: Natural hybridization has been reported. *CJS* 13431 has been identified as the hybrid *S. trimenii* by Dr. Moldenke.

Stachytarpheta mutabilis (N. Jacq.) Vahl, Enum. Pl. 1: 209. 1804; Gamble, Fl. Madras 1090(763). 1924. *Verbena mutabilis* N. Jacq., Coll. 2: 334. 1789.

Sparsely white-pubescent undershrubs. Petiole 1-2 cm long; blade ovate, decurrent along the petiole. Spike to 40 cm long, arched; bracts lanceolate; calyx to 1.5 cm long. Corolla pink-red, to 2 cm long; limb to 1.2 cm across.

Venezuela. Hassan and outskirts. All seasons. Used as a hedge and often naturalized. *CJS* 14354, *HFP* 1841.

SYMPHOREMA Roxburgh

Deciduous, scandent shrubs with yellow-tomentose enations. Leaves entire or toothed. Inflorescence centrifugal, capitate, peduncled, terminal, subtended by 6 foliar, accrescent, involucrate, imbricate bracts. Flowers regular, small, 7 per head. Calyx campanulate, persistent, 4-8-

toothed. Corolla 6-16-lobed. Stamens as many as corolla lobes, exserted, equal. Ovary 2-locular below middle 1-locular at apex; locules 2-ovulate, imperfectly 2-locellate, style elongate, bifid. Fruit dry, enclosed by calyx, abortively 1-seeded, 2-sulcate.

Symphorema involucratum Roxb., Pl. Cor. t. 186. 1798; Wight, Ic. t. 362. 1840; Gamble, Fl. Madras 1104(773). 1924.

Leaves toothed, ovate-lanceolate, abruptly acuminate, to 3×1.5 cm, membranous. Bracts subequal, oblong or obovate, papery, puberulous, to 3×1.5 cm (in fruit). Calyx 6-lobed. Corolla 8-lobed, white, to 1.2 cm long.

India, Burma. Collected once in flower in lower Bisle Ghat, on April 10, 1970. *CJS* 16774.

TECTONA Linnaeus f. *nom. cons.*

Large, deciduous stellate-tomentose trees. Leaves opposite or ternate, entire, large. Inflorescence a terminal, paniculate cyme, as large as leaves, profusely and dichotomously branched, centrifugal; bracts linear, small. Flower regular, small, sessile, 5-6-merous. Calyx lobed, accrescent. Corolla lobes spreading, imbricate. Stamens equal, just exserted. Ovary globular, hairy, 4-locular, 4-ovuled; style longish; stigma bifid. Drupe stellately tomentose, enclosed in the enlarged, inflated, scarious calyx, with one 4-locular pyrene.

Tectona grandis L. f., Suppl. 151. 1781; Roxb., Pl. Cor. t. 6. 1795; Bedd., Fl. Sylv. t. 250. 1872; Gamble, Fl. Madras 1092(765). 1924.

Deciduous trees to 30 m; branches angled. Petiole to 6 cm long, stout; blade elliptic-ovate, truncate or shortly narrowed at base, to 50×40 cm, coriaceous, shining above. Corolla white. Fruiting calyx very prominent.

Indomalaysia. Largely cultivated in dry deciduous State Forests, for the valuable timber, Teak. April-September. *CJS* 13427, *HFP* 355.

VITEX Linnaeus

Large shrubs or small trees. Leaves usually 3-7-foliolate, long-petiolate. Inflorescence a paniculate cyme, centrifugal; bracts linear or lanceolate. Flowers irregular, subsessile, 5-merous. Calyx cupular, toothed, subaccrescent. Corolla bilabiate; tube short, with a ring of hairs at the base of staminal filaments; upper lip 2-lobed, lower 3-lobed, middle one larger. Stamens 4, didynamous, exserted; filaments smooth or hairy; anther cells divaricate. Ovary pilose at apex, at first imperfectly 2-locular, finally 4-locellate, 4-ovulate; stigma slightly bifid at apex. Drupe enclosed by calyx, with one 4-locular, globular or ellipsoid pyrene.

1 Leaflets grey-pubescent beneath, membranous.....*V. negundo*
1 Leaflets not grey-pubescent beneath, coriaceous.
2 Inflorescence terminal. Drupe to 0.4 cm long.....*V. altissima*
2 Inflorescence axillary. Drupe to 2.2 cm long.....*V. leucoxylon*

Vitex altissima L. f., Suppl. 294. 1781; Wight, Ic. t. 1466. 1849; Bedd., Fl. Sylv. t. 252. 1872; Gamble, Fl. Madras 1102(772). 1924.

Lofty trees. Petiole often angular and winged, with auricles at base; leaflets 3, nearly sessile, entire, elliptic-lanceolate, to 15×4 cm, sparsely pubescent beneath, thick-chartaceous. Panicles terminal in upper axils, with short cymose branches. Corolla bluish-white. Drupe globular, to 0.5 cm across.

South India. Scattered across the District. Flowering March-May; fruiting to September. *HFP* 158, 595.

Vitex leucoxylon L. f., Suppl. 293. 1781; Gamble, Fl. Madras 1103 (772). 1924. *Walrothia leucoxylon* (L. f.) Roth, Nov. Pl. Sp. 319. 1821; Wight, Ic. t. 1467. 1849.

Small glabrescent trees. Petiolules 0.5-1 cm; leaflets 5, entire, elliptic-lanceolate, shortly, bluntly acuminate or obtuse, to 10×4 cm, chartaceous, sparsely pubescent beneath. Panicles axillary, corymbose, lax, divaricate, to 14 cm long. Corolla white; lower lip distinctly larger, with purple hairs within. Drupe ellipsoid or cylindrical, to 2×1 cm.

South W. India, Sri Lanka. Occasional in upper Ghats along streams. March-September. *HFP* 217, 2764.

Vitex negundo L., Sp. Pl. 638. 1753; Wight, Ic. t. 519. 1842; Gamble, Fl. Madras 1102(771). 1924.

Large, silvery-tomentose shrubs or small trees. Leaflets 3-5, middle one slightly longer petiolulate, entire, lanceolate, acuminate, to 12×2 cm, membranous. Panicles terminal, sometimes also from upper axils, to 15 cm, with short, cymose branches. Corolla blue. Drupe globular, to 0.3 cm across.

Asia. Frequent in upper Ghats. Flowering in January-February; fruiting in May-July. *CJS* 11704, 16393.

* * *

Among the cultivated plants *Citharexylum fruticosum* L. (incl. *C. subserratum* Sw.) and *C. spinosum* L. are reported from the District.

115. LAMIACEAE

K. N. Gandhi

Usually herbs. Leaves opposite, rarely whorled; stipules 0; blade simple, rarely palmatifid; margin usually serrate; venation usually

Fig. 93. LAMIACEAE. *A. Teucrium tomentosum*: flowering twig; *Aa*, dissected flower; *Ab*, ovary. *B. Anisochilus carnosus*: dissected flower; *Ba*, ovary. *C. Leonotis nepetifolia*: dissected flower. *D. Endostemon viscosus*: dissected flower. *E. Colebrookea oppositifolia*: dissected flower; *Ea*, fruiting calyx.

pinnate. Flowers bisexual, occasionally functionally unisexual, usually irregular. Calyx 4-10-lobed, often bilabiate, persistent. Corolla 4-5-lobed or -toothed, imbricate. Stamens on corolla tube, usually 4, didynamous. Disc prominent. Ovary superior, 2-locular, seemingly 4-partite-lobed, with solitary, basal ovule in each lobe; style 1, usually in depression of ovary between 4 lobes (gynobasic); stigma usually 2-fid. Fruit of 4, 1-seeded, usually erect nutlets; scar usually small and basal.

1 Leaves palmatifid.....**Leonurus**
1 Leaves simple or shallowly incised.
2 Flower whorls capitate.
3 Leaves cordate at base. Corolla 2-lipped.....**Anisochilus**
3 Leaves acute at base. Corolla obscurely 2-lipped.....**Acrocephalus**
2 Flower whorls various, not capitate.
4 Stamens 2.....**Salvia**
4 Stamens 4.
5 Calyx 6-10-toothed.
6 Calyx teeth spinescent; lower lip of corolla smaller than upper lip.....**Leonotis**
6 Calyx teeth not spinescent; lower lip of corolla equaling or larger than upper lip.....**Leucas**
5 Calyx 5-lobed.
7 Staminal filaments united at base into a sheath.....**Coleus**
7 Staminal filaments free.
8 Stamens declinate, lying upon or enclosed in the lower lip.
9 Lower lip of corolla longer than upper lip.....**Plectranthus**
9 Lower lip of corolla equaling or shorter than upper lip.
10 Flower whorls axillary. Calyx subequally 5-toothed.....**Hyptis**
10 Flower whorls in a terminal spike or raceme. Calyx 2-lipped; upper lip large.
11 Upper lip of corolla emarginate; style unequally 2-fid.....**Endostemon**
11 Upper lip of corolla 3-4-lobed; style entire or equally divided.
12 Corolla tube exserted; stigma subentire, capitate.....**Orthosiphon**
12 Corolla tube not or little exserted; stigma 2-fid, not capitate.....**Ocimum**
8 Stamens erect, ascending or spreading.
13 Corolla distinctly 2-lipped.
14 Calyx 2-lipped, pouched. Small herbs.....**Scutellaria**
14 Calyx not 2-lipped, nor pouched. Undershrubs.
15 Leaves more than 8 cm broad. Upper lip of corolla hooded, villous; anthers uniform.....**Gomphostemma**
15 Leaves less than 6 cm broad. Upper lip of corolla neither hooded nor villous; anthers dimorphic.....**Anisomeles**
13 Corolla seemingly 1-lipped.
16 Corolla lobes 5; ovary weakly 4-lobed.....**Teucrium**
16 Corolla lobes 4; ovary 4-partite.
17 Flowers unisexual. Stamens not bearded. Fruiting panicles long-plumose.....**Colebrookea**
17 Flowers bisexual. Stamens usually bearded. Fruiting panicles not plumose.
18 Leaves usually whorled, sessile. Corolla lobes equal.....**Dysophylla**
18 Leaves opposite, petioled. Corolla lobes unequal.....**Pogostemon**

ACROCEPHALUS Bentham

Inflorescence usually capitate, subtended by a pair of foliar bracts. Floral bracts setaceous, imbricate. Calyx 2-lipped, gibbous, ovoid, later tubular and suberect in fruit; upper lip large, entire, lower lip 4-lobed. Corolla obscurely 2-lipped; tube very short; lips subequal; upper lip shallowly 4-lobed; lower lip declinate, flat. Stamens declinate; anther cells confluent, reniform.

Acrocephalus indicus (N. Burman) Kuntze, Rev. Gen. Pl. 511. 1891; Gamble, Fl. Madras 1115(780). 1924; Keng, Gard. Bull. Straits Settlem. 24: 26. 1969. *Prunella indica* N. Burman, Fl. Ind. 130. 1768.

Pubescent herbs, 20-30 cm. Leaves narrowly ovate, cuneate, remotely serrate, to 3×0.7 cm, membranous. Heads to 0.6 cm across. Calyx pubescent. Corolla white, sparsely hairy at tip.

Indomalaysia, Indochina. Common amongst grasses on roadcuts and slopes in upper Ghats. September-November. *CJS* 15407, *HFP* 977.

ANISOCHILUS Wallich

Inflorescence usually capitate. Calyx 2-lipped, suberect in fruit; mouth oblique; tube inflated below the middle; upper lip usually decurved, broadest, entire; lower lip truncate or 4-toothed. Corolla slightly 2-lipped; upper lip entire or 3-4-toothed; lower entire, elongate, concave. Stamens declinate, exserted. Anthers 1-celled.

Anisochilus carnosus (L. f.) Wall., Pl. As. Rar. 2: 18. 1831; Gamble, Fl. Madras 1126(788). 1924. *Lavandula carnosa* L. f., Suppl. 273. 1781.

Perennial herbs, becoming fleshy with age. Petiole to 4 cm long; leaves serrate, ovate, cordate, to 5×3.5 cm, pubescent, membranous, deciduous. Heads strobiloid 2-4×1.2 cm. Upper lip of fruiting calyx conspicuous, depressed, closing the mouth. Corolla purple.

Central & South India, Sri Lanka, Burma. Fairly common in the Nagpuri range. October-January. *CJS* 13106, 15545.

ANISOMELES R. Brown

Note: Some authors consider *Epimeredi* Adanson (1763) as congeneric with *Anisomeles* R. Brown (1810). A proposal to conserve *Anisomeles* against *Epimeredi* was rejected (*Taxon* 20: 388. 1971). The reason for rejection is that there is no evidence that *Epimeredi* is congeneric with *Anisomeles*. Adanson's citation in his Index of "Epimeredi Ind[iarum]. *Stachys indica* H.[ortus] R.[egius] Par.[isiensis]" must be understood as "Epimeredi of the Indians, represented by *Stachys indica* cultivated in the Royal Gardens of Paris. Backer and Bakhuisen (*Fl. Java* 2: 624. 1965) state "I doubt whether *Epimeredi* Adanson and *Anisomeles* R. Brown are congeneric. The specimens in Herb. Adanson (Paris) are a

mixture and in my opinion *Anisomeles* is not represented." The type should be restudied to determine what species lectotypifies *Epimeredi*. In the meantime we accept Backer and Bakhuisen's statement that no species of *Anisomeles* will be involved in the lectotypification of *Epimeredi* Adanson.

Foliar bracts large. Floral bracts in pairs, linear. Calyx tubular, 10-nerved, equally 5-lobed. Corolla 2-lipped; tube annulate within; upper lip entire, flat; lower lip larger, with 4 spreading lobes. Stamens 4, didynamous; filaments bearded, anterior pair the longest and exserted; anthers dimorphic; lower 2, each with 2 transverse, parallel cells; upper 2 dimidiate (1-celled).

1 Greyish tomentose undershrubs. Leaves ovate.....*A. indica*
1 White tomentose undershrubs. Leaves lanceolate.....*A. malabarica*

Anisomeles indica (L.) Kuntze, Rev. Gen. Pl. 512. 1891; Gamble, Fl. Madras 1140(797). 1924; Keng, Gard. Bull. Straits Settlem. 24: 34. 1969. *Nepeta indica* L., Sp. Pl. 571. 1753. *Anisomeles ovata* Aiton, Hort. Kew. ed. 2, 2: 364. 1811; Wight, Ic. t. 865. 1844-1845. *Epimeredi indicus* (L.) Rothm., Feddes Repert. Spec. Nov. Regni Veg. 53: 12. 1944; Adams, Fl. Pl. Jamaica 639. 1972.

Undershrubs; stem acutely tetragonous, greyish tomentose. Blade ovate, truncate-cordate, to 5×3 cm. Cymes sessile, sometimes shortly peduncled in fruit. Corolla bluish-white to pink.

Indomalaysia, China. Occasional across the plains. In partial or full sun on dry, hard soil. September-March. *CJS* 11986, *HFP* 1415.

Note: The characters of this taxon coincide with that of *A. heyneana* Bentham except for the glabrescent nature of the latter. Otherwise it is difficult to separate these taxa.

Anisomeles malabarica (L.) R. Br. ex Sims, Bot. Mag. 46: t. 2071. 1819; Wight, Ic. t. 864. 1844-45; Gamble, Fl. Madras 1140(797). 1924; Keng, Gard. Bull. Straits Settlem. 24: 37. 1969. *Nepeta malabarica* L., Mant. Alt. 566. 1771. *Epimeredi malabaricus* (L.) Rothm., Feddes Repert. Spec. Nov. Regni. Veg. 53: 12. 1944.

Silvery tomentose undershrubs; stem obtusely tetragonous. Leaves lanceolate, round at base, to 9×2.5 cm. Calyx accrescent. Corolla pink.

Mauritius, Indomalaysia. Collected only once along Banavara-Arsikere road on January 21, 1970. *CJS* 16079.

COLEBROOKEA J. E. Smith

White-tomentose shrubs. Inflorescence spicate, often panicled. Flowers functionally unisexual. Calyx with 5 equal, capillary lobes, feathery in fruit. Corolla with 4 equal, flat lobes; tube very short. Stamens exserted in male flower, included in female flower, subequal. Pistil rudimentary in staminate flower.

Colebrookea oppositifolia J. E. Smith, Exot. Bot. 2: t. 115. 1805 ('*Colebrookia*'): Gamble, Fl. Madras 1137(796). 1924. *Colebrookea ternifolia* Roxb., Pl. Cor. t. 245. 1815.

Shrub. Leaves elliptic-lanceolate, to 20×5 cm. Panicle 10-15 cm long. Corolla white.

Pakistan, India, Burma. Common along the road in upper and lower Ghats. December-February. *CJS* 16249, *HFP* 1305.

COLEUS Loureiro

Calyx 2-lipped, enlarging in fruit; tube recurved; mouth oblique; upper lip broad, entire; lower lip with 4 unequal, narrow lobes. Corolla 2-lipped; tube curved, exserted; upper lip small, 3-4-lobed, recurved; lower lip elongated, deflexed, boat-shaped, entire, narrowed and constricted at base. Stamens exserted, declinate; filaments united into a sheath at base; anther cells confluent.

Note: The monadelphous nature of the stamens differentiates *Coleus* from *Plectranthus* Herit., where staminal filaments are free. There seems to be some disagreement over the status of these taxa. Here they are retained as distinct.

1 Herbs succulent. Whorls or raceme white-hispid, close.....*C. caninus*
1 Herbs not succulent. Whorls of raceme glabrous, lax.....*C. malabaricus*

Coleus caninus (Roth) Vatke, Linnaea 37: 318. 1871-1873; Raizada, Indian Forester 92: 306. 1966. *Plectranthus caninus* Roth, Nov. Pl. Sp. 279. 1821. *Coleus spicatus* Bentham in Wall., Pl. As. Rar. 2: 15. 1831; Wight, Ic. t. 1431. 1849; Gamble, Fl. Madras 1124 (786). 1924.

Petiole 0.5-1 cm; blade ovate-obovate, cuneate, to 2 cm across, fleshy, minutely pubescent. Raceme white-hispid, to 10 cm long; whorls densely packed. Calyx throat hairy; upper lip obtuse or minutely acute, equaling or longer than lower lip. Corolla pale lilac.

South India. Frequent at Bourdalboore and Arkalgud (dry plain). October-January. *CJS* 11342, 12007.

Coleus malabaricus Bentham in Wall., Pl. As. Rar. 2: 16. 1839; Gamble, Fl. Madras 1124(786). 1924.

Petiole to 12 cm long; blade ovate, rounded-cordate, to 16×11 cm, membranous. Raceme to 20 cm long; whorls lax. Calyx glabrous inside; upper lip mucronate, shorter than lower lip. Corolla white, tinged with purple, with minute red particles outside as on the undersurface of the leaves.

South W. India, Sri Lanka. Common in shade on wet ground of upper Bisle Ghat. June-November. *CJS* 11188, *HFP* 444.

Note: *Coleus scutellarioides* (L.) Bentham (incl. *C. blumei* Bentham) is generally cultivated in gardens as an ornamental.

DYSOPHYLLA Blume *nom. cons. prop.*

Note: Some of the botanists dealing with the *Pogostemon* group include *Dysophylla* in it, whereas others do not. El-Gazzer and Watson (*Taxon* 16: 186. 1967) transferred 4 species of *Dysophylla* Blume to *Pogostemon* of which *D. auricularia* (L.) Blume (the type species) happened to be one. As the rest of the species included under *Dysophylla* are without generic name, Airy Shaw (*Taxon* 16: 189. 1967) proposed a new name *Dysophylla* El-Gazzer & Wats. non Blume and conservation of it against *Dysophylla* Blume. This proposal was rejected (*Taxon* 17: 464. 1968). Bakhuizen & van Steenis (*Taxon* 17: 235. 1968) noted that Airy Shaw failed to observe an earlier, valid name, *Eusteralis* Rafin. Subsequently Bakhuizen, Keng & van Steenis (*Taxon* 19: 820. 1970) point out that the oldest name for the *Pogostemon-Dysophylla* complex is apparently *Alopecuro-Veronica* L. They further propose the conservation of both *Dysophylla* Bl. and *Pogostemon* Desf. against *Alopecuro-Veronica* L.

Pubescent herbs. Leaves verticillate, sessile, revolute, linear, deciduous and leaving an annular scar. Inflorescence a terminal, slender spike or raceme with continuous, whorled cymes. Calyx tubular, 5-dentate. Corolla tube exserted; lobes 4, equal. Stamens erect or usually declinate, subequal, exserted, spreading, bearded; anther cells confluent.

1 Stem erect. Leaves lanceolate.....*D. cruciata*
1 Stem procumbent. Leaves narrowly linear.....*D. tomentosa*

Dysophylla cruciata Bentham in Wall., Pl. As. Rar. 1: 30. 1830; Gamble, Fl. Madras 1137(795). 1924. *Dysophylla tetraphylla* Wight, Ic. t. 1144. 1849.

Erect. Leaves 4-6 in a whorl, lanceolate, to 2.5×0.3 cm, strigosely hispid. Basal inflorescence whorls subtended by 2 foliar bracts. Corolla purple or lilac.

Trop. Himalayas, South W. India. Locally common at Tagare. December-April. *CJS* 12330, 13116.

Dysophylla tomentosa Dalzell, Hooker's J. Bot. Kew Gard. Misc. 2: 337. 1850; Keng, Gard. Bull. Straits Settlem. 24: 71. 1969. *Dysophylla stellata* sensu Bentham, excl. basionym: Gamble, Fl. Madras 1137(795). 1924.

Procumbent. Leaves 5-10 in a whorl, linear, 0.5-1 cm long, white-pubescent. Basal inflorescence whorls subtended by whorls of foliar bracts. Corolla pink.

Central & South India. Common in fallow rice fields and moist soil in upper Ghats. December-April. *CJS* 12249, *HFP* 1407.

Note: While making the combination *Dysophylla stellata*, Bentham applied it to a South Indian plant. The basionym *Mentha stellata* Lour. however described a different plant ranging from India to Japan. The S. Indian plant has been referred to *Dysophylla tomentosa* Dalz. by Keng (*l.c.*).

ENDOSTEMON N. E. Brown

Inflorescence a raceme consisting of usually few-flowered verticillasters; bracts persistent. Pedicel decurved in fruit. Calyx 2-lipped, campanulate, slightly accrescent; upper lip entire; lower lip 4-toothed. Corolla equaling or longer than calyx, subequaly 4-lobed or obscurely 2-lipped; upper lobe often emarginate. Stamens included; anther 1-celled. Style unequally 2-fid.

Note: M. Ashby (*l.c.* 121) distinguishes *Endostemon* from *Orthosiphon* and other allied genera by the corolla which is, "subequaly 4-lobed, with all the lobes flat, and in the stamens, which are included in the corolla-tube, having very short pilose filaments."

Endostemon viscosus (Roth) M. Ashby, J. Bot. 74: 126, 1936. *Ocimum viscosum* Roth, Nov. Pl. Sp. 274. 1821 ('*Ocymum*'). *Ocimum diffusum* Bentham in Wall., Pl. As. Rar. 2: 14. 1831. *Orthosiphon diffusus* (Bentham) Bentham in DC., Prodr. 12: 50. 1848; Gamble, Fl. Madras 1113(779). 1924.

Stem woody at base; parts glandular-pubescent. Leaves shortly petiolate, ovate-orbicular, to 1×0.7 cm. Raceme terminal, 6-8 cm long; verticillasters 4-6-flowered. Calyx villous inside. Corolla pink, slightly exceeding calyx, 4-6 mm long.

South India, Sri Lanka. Common in scrub. May-September. *CJS* 13522, 17872.

GOMPHOSTEMMA Wallich ex Bentham

Stellately white-tomentose undershrubs. Calyx 2-lipped; tube slender; throat broad; upper lip hooded, emarginate; lower lip with spreading lobes. Stamens ascending, didynamous, anterior pair the longest; filaments hairy, exserted.

Gomphostemma heyneanum Wall. ex Bentham in Wall., Pl. As. Rar. 2: 12. 1831; Wight, Ic. t. 1456. 1849; Gamble, Fl. Madras 1157 (808). 1924.

Blade elliptic-ovate, rounded and shortly decurrent, to 22×12 cm, woolly beneath. Raceme 15-25 cm long. Calyx 1.5 cm long; lobes ovate. Corolla yellow, hairy, to 2 cm long. Nutlets smooth.

South W. India. Fairly common, usually in shade of forest undergrowth in upper Ghats. August-November. *CJS* 11445, *HFP* 566.

HYPTIS N. J. Jacquin

Calyx campanulate or tubular, 10-ribbed, 5-mucronate. Corolla obscurely 2-lipped; upper lip 2-lobed, erect or spreading; lower lip shorter, midlobe emarginate. Stamens declinate, didynamous; anther cells confluent.

Hyptis suaveolens (L.) Poit. Ann. Mus. Natl. Hist. Nat. 7: 472, t. 29, f. 2. 1806; Gamble, Fl. Madras 1129(789). 1924; Keng, Gard. Bull. Straits Settlem. 24: 96. 1969. *Ballota suaveolens* L., Syst. Nat. ed. 10, 1100. 1759.

Aromatic herbs. Blade ovate, obtuse, rounded at base, to 3×2 cm, softly, densely hirsute beneath. Calyx throat villous. Corolla blue.

Introduced from Tropical America. Naturalized. Collected only once at Shiradi border on December 20, 1968. *CJS* 12086.

LEONOTIS R. Brown

Inflorescence a verticillaster. Calyx tubular, 10-nerved; mouth oblique; teeth 8-10. Corolla 2-lipped; tube annulate within; upper lip erect, hooded, densely woolly at apex, entire; lower lip small, 4-lobed. Stamens didynamous, anterior pair the longest; filaments ascending under the upper lip, warted; anther cells divergent. Style very unequaly bifid.

Leonotis nepetifolia (L.) R. Br., Prodr. 504. 1810; Wight, Ic. t. 867. 1844-1845; Gamble, Fl. Madras 1155(807). 1924 ('*nepetaefolia*'). *Phlomis nepetifolia* L., Sp. Pl. 586. 1753 ('*nepetaefolia*').

Glabrous undershrubs. Blade ovate-lanceolate, to 7×4 cm, membranous. Verticillaster 8 cm across. Calyx tube hairy, 1.5 cm long, bent above the middle; teeth 8, spinescent, unequal, posterior tooth the longest. Corolla 2 cm long, orange.

Trop. Asia, Africa, America. Fairly common along hedges in plains. September-December. *HFP* 1204, 2125.

LEONURUS Linnaeus

Basal leaves deeply lobed; lobes irregularly incised. Inflorescence a verticillaster. Calyx tubular, 10-nerved; teeth 5, (rarely with a short 6th tooth) subspinescent, subequal. Corolla 2-lipped; upper lip hooded, woolly at apex, equaling 4-lobed lower lip. Stamens didynamous, anterior pair longer; filaments ascending under upper lip, toothed; anther cells connivent.

Leonurus sibiricus L., Sp. Pl. 584. 1753; Gamble, Fl. Madras 1143 (800). 1924; Keng, Gard. Bull. Straits Settlem. 24: 98. 1969.

Leaf segments to 6×1 cm, membranous. Corolla pink; tube annulate within.

Pantropical. Collected once, along the road on outskirts of Hassan town. September. *HFP* 2110.

LEUCAS R. Brown

Inflorescence a verticillaster. Calyx 10-nerved, teeth 8-10. Corolla usually white, 2-lipped; upper lip hooded, densely woolly, entire; lower lip 3-lobed, middle lobe larger. Stamens didynamous, anterior pair longer; filaments ascending under upper lip; anther cells divergent, at length confluent.

1 Calyx mouth oblique.
2 Calyx tube bent at middle.....*L. martinicensis*
2 Calyx tube erect.....*L. lavandulifolia*
1 Calyx mouth not oblique.
3 Throat of calyx glabrous.
4 Leaves silvery white-tomentose beneath. Flowers subsessile.....*L. marrubioides*
4 Leaves only hairy beneath. Flowers distinctly pedicelled.....*L. mollissima*
3 Throat of calyx villous.
5 Upper lip of corolla with rufous hairs.....*L. ciliata*
5 Upper lip of corolla with white hairs.
6 Leaves distinctly serrate, ovate-lanceolate.....*L. eriostoma*
6 Leaves obscurely serrate, linear-oblong.....*L. hirta*

Leucas ciliata Bentham in Wall., Pl. As. Rar. 1: 61. 1830; Gamble, Fl. Madras 1153(806). 1924.

Petiole 2-3 cm long; blade serrate, ovate, cuneate, pale green beneath, membranous. Verticillasters terminal, 1-2, many-flowered, 4-5 cm across. Calyx mouth even; throat glabrous. Upper lip of corolla with rufous hairs; lower lip longer.

India. Common in upper Ghats. All seasons. *HFP* 1287, 2602.

Leucas eriostoma J. Hooker, Fl. Brit. India 4: 686. 1885; Gamble, Fl. Madras 1154(806). 1924.

Leaves serrate or crenulate, oblong-lanceolate, to 8×2 cm. Verticillasters terminal, 1-3, many-flowered; bracts linear, 0.8 cm long. Calyx tube constricted above the middle; teeth 10, equal, 1 mm long; mouth even; throat with dense white hairs. Upper lip equaling lower lip.

South India. Fairly common in upper Ghats. August-January. *CJS* 12468, 17994.

Leucas hirta (Roth) Sprengel, Syst. 2: 743. 1825; Gamble, Fl. Madras 1153(806). 1924. *Phlomis hirta* Heyne ex Roth, Nov. Pl. Sp. 264. 1821.

Leaves subsessile, subentire, oblong-lanceolate, to 3×0.5 cm. Verticillasters 1-3, in the upper axils, many-flowered. Calyx tube 0.6 cm; teeth 10, subequal; mouth slightly oblique (even with age); villi of the throat conspicuous, longer than the teeth. Upper lip slightly shorter than lower lip.

South India. Common across the plains. All seasons. *CJS* 13750, 14714.

Leucas lavandulifolia J. E. Sm. in Rees, Cyclop. 20: n. 2. 1812; Keng, Gard. Bull. Straits Settlem. 24: 103. 1969. *Phlomis linifolia* Roth, Nov. Pl. Sp. 260. 1821. *Leucas linifolia* (Roth) Sprengel, Syst. 2: 743. 1825; Gamble, Fl. Madras 1149(803). 1924.

Leaves subserrate, linear-lanceolate, to 10×1.5 cm, membranous. Verticillasters 1-2, terminal, many-flowered. Calyx pubescent outside; teeth 8-10, the posterior one the longest; mouth oblique; throat glabrous. Upper lip shorter than lower lip.

Indomalaysia. Common across plains and upper Ghats. All seasons. *CJS* 13477, *HFP* 1822.

Leucas marrubioides Desf., Mem. Mus. Hist. Nat. 11: 6, t. 3, f. 1. 1824; Gamble, Fl. Madras 1152(805). 1924.

Blade serrate, ovate, subcordate at base, to 3×2 cm, silvery tomentose beneath. Verticillaster axillary and terminal, lax, with 2-4 subsessile flowers. Calyx teeth subequal; mouth even; throat glabrous. Upper lip with white hairs, shorter than lower lip.

South W. India, Sri Lanka. Occasional across plains and upper Ghats. All seasons. *CJS* 10852, 14678.

Leucas martinicensis (N. Jacq.) R. Br., Prodr. 504. 1810; Gamble, Fl. Madras 1149(803). 1924. *Clinopodium martinicense* N. Jacq., Amer. Hist. 173. 1763.

Blade coarsely serrate, ovate, subobtuse at base, to 8×3.5 cm, chartaceous. Verticillasters many, axillary or terminal, few-flowered at base and apex, many flowered in between, 2-3 cm across. Calyx sigmoidly curved at middle; teeth 10, spinescent, the posterior one twice longer than rest; mouth oblique; throat glabrous. Upper lip equaling lower lip.

Pantropical. Occasional across plains. All seasons. *CJS* 15337, 15372.

Leucas mollissima Wall. ex Bentham in Wall., Pl. As. Rar. 1: 62. 1830; Gamble, Fl. Madras 1151(805). 1924; Keng. Gard. Bull. Straits Settlem. 24: 106. 1969.

Tomentose stragglers. Blade coarsely serrate, ovate, truncate at base, to 3×2 cm, membranous. Verticillasters axillary, many, with 2-3 subsessile flowers on each side. Calyx teeth 10, nearly equal; mouth even; throat glabrous. Upper lip equaling lower lip.

India to S. China, Malaysia. Collected only once at Belvathally on September 5, 1969. *CJS* 17859.

OCIMUM Linnaeus

Flowers with decurved pedicels. Calyx tubular, bilipped, deflexed

and accrescent in fruit; upper lip entire, large; lower lip unequaly 4-mucronate. Corolla 2-lipped; tube included, not annulate; upper lip 4-lobed; lower lip entire, flat, declinate, subequaling upper lip. Stamens declinate; anther cells confluent.

1 Calyx tube hairy within.....*O. americanum*
1 Calyx tube glabrous within.....*O. adscendens*

Ocimum adscendens Willd., Sp. Pl. 3: 166. 1800; Gamble, Fl. Madras 1112(778). 1924.

Herbs. Blade ovate or obovate, cuneate-truncate, to 1.5×1 cm, membranous. Raceme to 10 cm long; whorls lax. Pedicels 0.25 cm. Calyx glabrous; two lower teeth of lower lip longer than other two. Corolla white. Nutlets mucilaginous when wetted.

Central & S. India. Occasional in eastern plains. July-October. *CJS* 15336, 15362.

Ocimum americanum L. in Juslenius, Cent. I. Pl. 15. 1755; Keng, Gard. Bull. Straits Settlem. 24: 126. 1969. *Ocimum canum* Sims, Bot. Mag. 51: t. 2452. 1823; Gamble, Fl. Madras 1111(777). 1924.

Herbs. Blade ovate, acute at both ends, to 3×1.5 cm. Raceme 10-15 cm long; pedicels 1-2 cm long. Calyx villous. Corolla white. Nutlets mucilaginous when wetted.

Paleotropics. Occasional across plains. All seasons. *CJS* 10756, 11976.

Note: *O. sanctum* L. 'Sacred Basil,' *Tulasi* (Kannada) is frequently cultivated in pots or on pedestals in Hindu houses and temples.

ORTHOSIPHON Bentham

Calyx tubular or campanulate, bilipped, deflexed in fruit; upper lip broad; lower lip 4-lobed; lateral lobes aristate; middle lobes subulate. Corolla bilipped; tube as long as or exserted from calyx tube; upper lip 3-4-lobed; lower lip entire. Stamens declinate, exserted; anther cells confluent. Stigma capitate or clavate, entire or emarginate.

Orthosiphon rubicundus (D. Don) Bentham in Wall., Pl. As. Rar. 2: 14. 1831; Gamble, Fl. Madras 1114(779). 1924. *Plectranthus rubicundus* D. Don, Prodr. Fl. Nepal. 116. 1825 ('*Plectranthes rubicunda*').

Pubescent herbs. Leaves ovate, cuneate, to 8×6 cm. Raceme 12-15 cm long; bracts 2-3 mm long, pubescent. Calyx 5 mm long; corolla white; tube to 7 mm long. Stamens slightly exserted from corolla tube.

India, Burma. Frequent in scrub. May-July. *HFP* 1713, 1807.

Note: Some authors (Gamble, *l.c.*, J. Hooker, *Fl. Brit. India* 4: 614, 1885) characterize this taxon with included stamens.

PLECTRANTHUS L'Heritier *nom. cons.*

Inflorescence a terminal raceme, often panicled. Corolla 2-lipped; tube exserted; upper lip 4-lobed; lower lip entire or notched, elongate, deflexed, boat-shaped. Stamens declinate, didynamous; filaments toothed; anther cells confluent.

1 Succulent herbs; leaves without any red glands beneath; flowers blue.....*P. mollis*
1 Slender herbs; leaves with minute red glands beneath; flowers white.....*P. stocksii*

Plectranthus mollis (Aiton) Spreng., Syst. 2: 690. 1825; Sant., Fl. Khandala ed. 3, 216. 1967. *Ocimum molle* Aiton, Hort. Kew. 2: 322. 1789. *Plectranthus incanus* Link, Enum. Hort. Berol. 2: 120. 1822; Gamble, Fl. Madras 1121(784). 1924.

Succulent, pubescent herbs. Leaf ovate, cordate at base, to 10×8 cm, membranous. Raceme with or without side branches at base, to 15 cm long. Upper lip of calyx broad, entire; lower lip 4-toothed, longer and unequal. Corolla lilac or purplish blue. Stamens included.

India. Occasional across plains on wet soil. July-October. *HFP* 525, 2168.

Plectranthus stocksii J. Hooker, Fl. Brit. India 4: 618. 1885; Gamble, Fl. Madras 1120(784). 1924.

Slender, pubescent herbs, often decumbent, with minute, shining, red glands especially beneath the leaves and on the calyx and corolla. Leaf ovate, truncate at base, pale green beneath. Inflorescence a slender panicle, 15-25 cm long. Pedicels capillary. Upper lip of calyx 2-lobed; lower lip 3-lobed. Corolla white. Stamens exserted.

Central & S. India. Frequent in upper Ghats. August-October. *HFP* 833, 1005.

POGOSTEMON Desfontaines, *nom. cons. prop.*

(See note under *Dysophylla* regarding conservation).

Undershrubs. Inflorescence a simple spike or panicle. Calyx tubular, equally 5-dentate. Corolla usually exserted, sub-2-lipped, sometimes minute; lobes 4, unequal. Stamens equal; filaments exserted; anther cells confluent.

1 Inflorescence a simple raceme.....*P. mollis*
1 Inflorescence a panicle (branched spike or raceme).
2 Whorls separated on the spike, semilunate in shape.....*P. paniculatus*
2 Whorls close on the spike, not semilunate.
3 Leaves membranous. Calyx just longer than bracts.....*P. purpurascens*
3 Leaves chartaceous. Calyx shorter than bracts.
4 Inflorescence densely white-tomentose.....*P. benghalensis*
4 Inflorescence sparsely brown-tomentose.....*P. pubescens*

Pogostemon benghalensis (N. Burman) Kuntze, Rev. Gen. Pl. 529. 1891; Sant., Fl. Khandala ed. 3, 217. 1967. *Origanum benghalense* N. Burman, Fl. Ind. 128, t. 38, f. 3. 1768. *Pogostemon plectranthoides* Desf., Ann. Mus. Natl. Hist. Nat. 2: 156, t. 6. 1808; Gamble, Fl. Madras 1133(793). 1924.

Leaf doubly serrate, truncate at base, to 12×7 cm, white-tomentose beneath. Panicle conspicuously white-tomentose. Whorls close, stalked, subtended by foliar bracts, 2-4 cm long. Calyx shorter than bracts. Corolla purple.

India. Collected only once in Shiradi Ghat on January 15, 1969. *CJS* 12280.

Pogostemon mollis Bentham, Lab. Gen. Sp. 155. 1833; Gamble, Fl. Madras 1134(793). 1924.

Suffrutescent; tomentum dark tawny. Leaves shortly crenate, ovate-orbicular, to 2.5×2 cm. Raceme simple, hispid, 6 cm long, with close whorls. Calyx longer than bract. Corolla white.

Western Ghats. Common at Vanagur. September-December. *CJS* 15499, 15766.

Pogostemon paniculatus (Willd.) Bentham in Wall., Pl. As. Rar. 1: 30. 1830; Gamble, Fl. Madras 1132(792). 1924. *Elsholtzia paniculata* Willd., Sp. Pl. 3: 59. 1800.

Leaves in equal or unequal pairs; blade irregularly incised, acute at both ends, to 10×6 cm, with appressed pubescence. Whorls on panicle generally secund, 0.5-1 cm apart, becoming semilunate with age, subtended by longer foliar bracts. Calyx longer than bracts. Corolla purple.

South W. India. Common in upper Ghats. October-December. *CJS* 12105, 15771.

Pogostemon pubescens Bentham in DC., Prodr. 12: 152. 1848; Gamble, Fl. Madras 1133(793). 1924.

Leaf singly or doubly serrate, to 10×5 cm, tomentose beneath. Panicle greyish-tomentose. Whorls rather close, sessile. Calyx shorter than bracts. Corolla pink.

South W. India. Frequent in upper Ghats. January-June. *CJS* 9775, *HFP* 1573.

Note: The taxon is quite similar to *P. benghalensis.*

Pogostemon purpurascens Dalzell, Hooker's J. Bot. Kew Gard. Misc. 2: 337. 1850; Gamble, Fl. Madras 1133(792). 1924.

Leaves in unequal pairs, irregularly serrate-crenate, to 7×4 cm, with appressed hairs. Whorls on panicle close, sessile. Calyx shorter than bracts. Corolla white, with purple upper lip.

South W. India. Collected once from Vanagur on January 29, 1969. *CJS* 12535.

Note: The taxon resembles *P. paniculatus* from which it can be differentiated by its non-secund and non-semilunate whorls.

SALVIA Linnaeus

Inflorescence a terminal raceme. Calyx usually 2-lipped, 3-5-toothed. Corolla showy, 2-lipped; upper lip entire; lower lip 3-lobed, spreading. Stamens 2, anterior, exserted; filaments articulate with the linear transverse connective; connective with an ascending branch bearing a fertile cell and a deflexed branch ending in a sterile or empty cell. Staminodes 2 or absent.

Salvia coccinea Buc'hoz ex Etlinger, Salvia 23. 1777; Adams, Fl. Pl. Jamaica 641. 1972.

Stem and branches sparsely hairy. Leaf ovate, truncate at base, to 3×2 cm, pubescent. Raceme 8-15 cm long; whorls many-flowered; foliar bracts deciduous. Upper lip of calyx entire; lower lip 2-lobed; throat glabrous. Corolla orange-red, 2-3 cm long; throat glabrous. Style branches unequal.

Neotropics. Escape. Cultivated in gardens for ornamental and medicinal purposes. All seasons. *CJS* 13463.

Note: Several species of *Salvia* are cultivated.

SCUTELLARIA Linnaeus

Inflorescence a terminal raceme. Calyx 2-lipped, pouched on the back, 10-nerved; mouth closed after flowering; lips entire, upper lip with a broad plate and deciduous. Corolla 2-lipped; tube recurved above the calyx, dilated at throat, not annulate; upper lip hooded, entire or notched, often sparsely hairy without; lower lip 3-lobed. Stamens didynamous, anterior pair longer; anthers dimorphic, two 1-celled and two 2-celled. Style subentire. Nutlets transverse.

Scutellaria discolor Wall. ex Bentham in Wall., Pl. As. Rar. 1: 66. 1830; Gamble, Fl. Madras 1142(798). 1924; Keng, Gard. Bull. Straits Settlem. 24: 165. 1969. *Scutellaria indica* auct. non L.: D. Don, Prodr. Fl. Nepal. 109. 1825.

Annual, pubescent, suffrutescent herbs. Leaves chiefly radical, sometimes sub-basal, elliptic-orbicular, to 6×5 cm. Racemes 1-few, 20-30 cm long. Flowers paired or somewhat ternate. Corolla blue or purple, often with white lower lip. Nutlets echinate.

Asia. Fairly common in shade under bushes and shrubs in upper Ghats. June-September (monsoon). *HFP* 196, 1872.

Note: Confused with *S. violacea* Heyne ex Bentham which has a branched stem and cauline leaves.

Bentham (in DC., *Prodr.* 12: 417. 1848), J. Hooker, (*Fl. Brit. India* 4: 667. 1885) and *Index Kew.* credit the binomial to Colebrooke in Wallich (*l.c.*). However, Bentham (in Wallich, *l.c.*) attributed the name to "Wall., Mss."

TEUCRIUM Linnaeus

Inflorescence a panicle. Calyx tubular, 10-nerved, unequaly 5-toothed. Corolla 5-lobed, with lower one larger. Stamens spreading, didynamous, anterior pair the longest; filaments hairy toward base; anther cells confluent. Ovary 4-lobed; style immersed but not gynobasic, bifid. Nutlets with a prominent scar on the inner side.

Teucrium tomentosum Heyne ex Bentham in Wall., Pl. As. Rar. 1: 58. 1830; Gamble, Fl. Madras 1158(809). 1924.

Softly pubescent herbs. Leaf ovate, to 9×6 cm. Panicle 6-15 cm long. Bracts lanceolate. Calyx 0.5 cm long. Corolla white, 1.5 cm long; lobes rounded at apex.

Central & S. India to Sri Lanka. Locally common at Malgod, at foot of Genkalbetta. November-February. *CJS* 15918.

116. BUDDLEJACEAE

K. N. Gandhi

BUDDLEJA Linnaeus

Usually shrubs or trees covered with stellate tomentum. Leaves opposite; stipules present or reduced to a line connecting petiole bases; blade simple; venation pinnate. Bracts and bracteoles present. Flowers bisexual, regular, usually 4-merous. Calyx gamosepalous, lobed. Corolla gamopetalous, imbricate. Stamens usually 4, inserted in corolla tube; anthers subsessile, medifixed. Ovary superior, 2-locular, with numerous, many-seriate, axillary ovules; style short; stigma capitate. Fruit a septicidal 2-valved capsule.

Buddleja asiatica Lour., Fl. Cochinch. 72. 1790; Gamble, Fl. Madras 865(608). 1923; Leenhouts in Steenis, Fl. Malesiana ser. 1, 6: 337. 1962. *Buddleja discolor* Roth, Nov. Pl. Sp. 82, 1821; Wight, Ic. t. 894. 1844-45.

Fig. 94. BUDDLEJACEAE. *A. Buddleja asiatica*: flowering twig; *Aa, Ab,* flower; *Ac,* same, dissected; *Ad,* pistil; *Ae,* same in section; *Af,* ovary in section.

Shrubs or small trees. Petiole 0.5-1 cm long; blade oblong-lanceolate, serrulate, acuminate, rounded-cuneate, 8-11 × 1.6-2 cm, dark green and glabrescent above, white-tomentose beneath. Inflorescence a terminal spiciform panicle, 12-18 cm long. Corolla white, 0.5 cm long. Capsule ovate or oblong, apiculate, 0.4 cm long, brown, glabrous.

Indomalaysia. Occasional at Yettinahalla (upper Shiradi Ghat). Probably flowering throughout the year. *CJS* 16909, *HFP* 914.

117. OLEACEAE

T. P. Ramamoorthy

Woody. Leaves opposite or subopposite, estipulate, usually simple, entire, pinnately veined. Flowers usually bisexual, regular. Calyx 4-lobed or 4-10-fid; petals 4, 6-12, usually connate; disc none. Stamens 2, epipetalous. Ovary superior, 2-locular; ovules usually 2 per locule and subapical; stigma sometimes lobed. Fruit usually a fleshy drupe.

Fig. 95. OLEACEAE. *A. Jasminum azoricum*: flowering branch. *B. Olea dioica*: flower with petals cut and spread out; *Ba*, ovary, vertical section; *Bb*, same, cross section; *Bc*, male flower with petals split open; *Bd*, stamen. *C. Linociera malabarica*: flowering branch; *Ca*, flower. *D. Ligustrum gamblei*: flower. *E. Jasminum ritchiei*: flowering branch. *F. Jasminum malabaricum*: fruit.

1 Petals imbricate; plants climbing.....**Jasminum**
1 Petals valvate; plants erect.
2 Inflorescence terminal.....**Ligustrum**
2 Inflorescence axillary.
3 Petals free or connate by pairs.....**Linociera**
3 Petals all connate.....**Olea**

JASMINUM Linnaeus

Usually climbing. Leaves sometimes trifoliate. Inflorescence of panicles or cymes. Flowers 4-10-merous. Corolla tube much exserted; lobes imbricate in bud. Ovules usually 2 per locule, basal; stigma 2-fid oblong. Fruit usually 2-seeded and 2-lobed.

1 Leaves 3-foliate.....*J. azoricum*
1 Leaves simple.
2 Bracts foliaceous, white-pubescent.....*J. rottlerianum*
2 Bracts not foliaceous, green.
3 Enations hairy; flower less than 2 cm long; calyx lobes less than 0.1 cm, thickened on back, hairy.....*J. roxburghianum*
3 Enations glabrous; flower more than 2 cm long; calyx lobes subulate, 0.2-0.7 cm long.
4 Calyx lobes hairy.....*J. malabaricum*
4 Calyx lobes glabrous.
5 Calyx lobes subulate, 0.7 cm long.....*J. cuspidatum*
5 Calyx lobes oblong-acute, less than 0.3 cm long.....*J. ritchiei*

Jasminum azoricum L., Sp. Pl. 7. 1753; Backer & Bakh. f., Fl. Java 2: 217. 1965. *Jasminum flexile* Vahl, Symb. Bot. 3: 1. 1794; Gamble, Fl. Madras 791(556). 1923.

Leaves trifoliate; petiole twisted at tip; leaflets 7-12×2-4 cm, oblong-elliptic, subtruncate at base. Calyx 5-toothed, puberulous at tip; corolla lobes 6, rounded. Berry ellipsoid, to 1.4×0.7 cm, sometimes deformed.

South W. India, Java. Fairly common in Ghats, in undergrowth and at edges of semi-evergreen forests. December-February. *CJS* 15842, 16284.

Jasminum cuspidatum Rottler, Ges. Naturf. Freunde Berlin Neue Schriften 4: 192. 1803. *Jasminum rigidum* Zenker, Pl. Ind. 5, t. 6. 1835; Wight, Ic. t. 1247. 1848; Gamble, Fl. Madras 790(555). 1923.

Leaves elliptic, acute at both ends. Calyx glabrous; lobes 5, subulate. Corolla white, with 9, acute lobes.

South W. India, Sri Lanka. Common in open scrub and deciduous forests in the plains and occasional in upper Ghats. All seasons. *CJS* 16086, *HFP* 1334.

Note: The above nomenclature is the result of the acceptance of synonymy listed by C. B. Clarke (in J. Hooker, *Fl. Brit. India* 3: 598. 1882).

Jasminum malabaricum Wight, Ic. t. 1250. 1848; Gamble, Fl. Madras 789(554). 1923.

Blade 6.5-12×5.8 cm, broadly ovate, subcordate. Calyx lobes 5, 0.5-0.6 cm, subulate, hairy; corolla white, with 8, acute lobes. Berry oblong, 1×0.7 cm, turning black when dry.

South W. India. Common in wet deciduous to semi-evergreen forests in the Ghats. January-July. *CJS* 16433, *HFP* 1562.

Jasminum ritchiei C. B. Clarke in J. Hooker, Fl. Brit. India 3: 598. 1882; Gamble, Fl. Madras 790(555). 1923.

Blade 3-7.5×2-3.5 cm, ovate-elliptic. Calyx lobes 5, less than 0.3 cm, acute, glabrous; corolla white, with 9, acute lobes.

South W. India, Sri Lanka. Common in shade in undergrowth and at edges of wet deciduous forests in upper Ghats. June-September. *CJS* 14321, *HFP* 2010.

Jasminum rottlerianum Wall. ex A. DC. in DC., Prodr. 8: 305. 1844; Wight, Ic. t. 1249. 1848; Gamble, Fl. Madras 789(554). 1923.

Villous. Blade 5.5-11×2.5-4.5 cm, ovate-lanceolate, acute-acuminate, cuneate. Bracts ovate-lanceolate. Calyx lobes 5, subulate, hairy; corolla white; lobes 6, acute.

South W. India. Fairly common in thickets and at edges of semi-evergreen forests in lower Ghats. January-March. *CJS* 12560, 16511.

Jasminum roxburghianum Wall. ex C. B. Clarke in J. Hooker, Fl. Brit. India 3: 595. 1882; Gamble, Fl. Madras 789(555). 1923.

Enations pubescent. Blade 3×2.1 cm, broadly ovate, subcordate. Calyx lobes 5, rounded, convex, hairy, less than 2.1 cm; corolla white; lobes 5, ovate, acute.

South W. India. Common in open scrub forests and thickets in the plains at Bourdalboore, Belvathally and Nagpuri. June-September. *CJS* 13830, *HFP* 2822.

Note: Our identification is tentative.

LIGUSTRUM Linnaeus

Inflorescence of terminal panicles. Corolla lobes induplicate-valvate. Style elongate; stigma subclavate.

Ligustrum gamblei Ramam. *nom. nov. Ligustrum roxburghii* C. B. Clarke in J. Hooker, Fl. Brit. India 3: 615. 1882, non Blume 1850, non Hort. ex Decne., 1877: Gamble, Fl. Madras 797(560). 1923. *Phillyrea robusta* Roxb., Fl. Ind. 1: 101. 1820. *Olea roxburghii* Wall., List. 2816. 1831, *nom.*, non Sprengel 1822. *Visiania robusta* (Roxb.)

A. DC. in DC., Prodr. 8: 305. 1844. *Ligustrum robustum* (Roxb.) Bedd., For. Man. 154. 1873, non Blume, 1850, nec Thwaites, 1860.

Shrubs. Leaves 5-12×3.5 cm, oblong-lanceolate, acuminate-rounded, glabrous. Panicle pubescent. Flowers white.

South W. India. Common along edges of wet deciduous and semi-evergreen forests in upper and middle Ghats. August-September. *CJS* 12790, 14452.

LINOCIERA Swartz *nom. cons.*

Inflorescence of fascicles or panicles. Petals 4, free or cohering in pairs, induplicate-valvate. Style very short; stigma capitate, bilobed.

1 Flowers fascicled.....*L. malabarica*
1 Flowers panicled.....*L. ramiflora*

Linociera malabarica Wall. ex G. Don, Gen. Syst. 4: 53. 1837; Wight, Ic. t. 1246. 1848; Gamble, Fl. Madras 795(558). 1923; Sprague, Bull. Misc. Inform. 313. 1925.

Trees to 8 m. Leaves 5-10×2-4 cm, elliptic, acute at both ends; venation indistinct. Flower sessile, white, fascicled in branching cymes. Drupe 1-seeded.

South W. India. Common along edges of semi-evergreen and wet deciduous forests in Ghats. November-March. *CJS* 15957, *HFP* 2567.

Linociera ramiflora (Roxb.) Wall. ex G. Don, Gen. Syst. 4: 52. 1838. *Chionanthes ramiflora* Roxb., Fl. Ind. 1: 107. 1832. *Linociera intermedia* Wight, Ic. t. 1245. 1848; Gamble, Fl. Madras 794(558). 1923.

Trees. Leaves 7-16×3.5-5 cm, elliptic, oblong-lanceolate, acute at both ends. Flowers white, panicled.

South W. India. Occasional, in dry deciduous forests in the hilly regions of the eastern plains at Nagpuri. June-August. *HFP* 159.

OLEA Linnaeus

Inflorescence of panicles. Flowers often polygamous, 4-merous. Calyx lobes acute. Corolla lobes valvate. Style short; stigma capitate, sometimes bifid. Drupe ellipsoid, 1-seeded.

Olea dioica Roxb., Fl. Ind. 1: 105. 1820; Gamble, Fl. Madras 796(559). 1923.

Evergreen trees, to 15 m. Leaves 7-15×3-6 cm, elliptic-lanceolate, entire (crenate in juvenile forms). Flower white.

N. E. India, South W. India. Common in semi-evergreen forests of Ghats. December-August. *CJS* 12355, 16328, 16803.

118. SCROPHULARIACEAE

C. J. Saldanha

Usually herbs. Leaves generally opposite, sometimes alternate above, often progressively passing into bracts; stipules 0; blade simple; venation usually pinnate; bracteoles 0 or 2. Flowers usually bisexual, irregular. Sepals usually 5, united, persistent. Corolla 4-5-lobed, often bilipped. Stamens 4 didynamous or 2 with 2 staminodes, rarely 5. Disc present. Ovary superior, 2-locular, usually with numerous axile ovules; stigma entire to 2-fid. Fruit usually a capsule; seeds generally small, endospermous.

1 Bracteoles absent.
2 Upper lip of corolla galeate, interior in bud.....**Pedicularis**
2 Upper lip of corolla not galeate, exterior in bud.
3 Plants minute, tufted; stamens 2; staminodes 0.....**Glossostigma**
3 Plants otherwise; stamens 4 or 2 with 2 staminodes.
4 Calyx 4-lobed; corolla throat densely barbate.....**Scoparia**
4 Calyx 5-lobed; corolla throat not densely barbate.
5 Anther cells stipitate; style inflexed at apex.....**Limnophila**
5 Anther cells not stipitate; style erect.
6 Anther cells parallel; stamens 2.....**Dopatrium**
6 Anther cells divergent; stamens 4 or 2.
7 Calyx tube ribbed or winged; fruit included.....**Torenia**
7 Calyx tube generally smooth; fruit exserted.....**Lindernia**
1 Bracteoles 2.
8 Anthers 1-celled.
9 Corolla tube almost straight; upper lip 2-lobed.....**Buchnera**
9 Corolla tube incurved at or above the middle; upper lip emarginate.....**Striga**
8 Anthers 2-celled.
10 Anther cells stipitate.
11 Bracteoles at base of pedicel; calyx lobes dissimilar.....**Mecardonia**
11 Bracteoles subtending calyx; calyx lobes similar.
12 Limnophytes; style flexed at apex; septum seemingly winged in fruit; seeds angled (bracteoles sometimes absent).....**Limnophila**
12 Not limnophytes; style not flexed; septum not winged; seeds not angled..**Stemodia**
10 Anther cells not stipitate.
13 Anther cells equal.
14 Decumbent plants; leaves entire.....**Bacopa**
14 Erect plants; leaves finely dissected.....**Micrargeria**
13 Anther cells unequal.
15 Calyx spathaceous, split on one side.....**Centranthera**
15 Calyx tubular, ribbed.....**Sopubia**

BACOPA Aublet *nom. cons.*

Leaves often punctate. Flowers axillary, solitary or fascicled. Calyx bibracteate, deeply 5-partite; lobes unequal. Corolla 2-lipped; upper lip exterior in bud. Stamens 4, didynamous. Seeds reticulate.

Fig. 96. SCROPHULARIACEAE. *A. Limnophila indica*: flowering branch; *Aa*, flower. *B. Mecardonia procumbens*: flower. *C. Torenia linderniodes*: flower. *D. Pedicularis zeylanica*: flower; *Da*, section of ovary. *E. Striga densiflora*: section of flower. *F. Centranthera indica*: dissected corolla. *G. Lindernia parviflora*: dissected corolla. *H. Dopatrium junceum*: flower. *I. Glossostigma diandrum*: flower.

Bacopa monnieri (L.) Wettstein in Engl. & Prantl, Pflanzenfam. 4(3b): 77. 1891 ('*monniera*'); Pennell, Proc. Acad. Nat. Sci. Philadelphia 98: 94. 1946. *Lysimachia monnieri* L. in Torner, Cent. II. Pl. 9. 1756. *Gratiola monnieri* (L.) L., Syst. Nat. ed. 10, 851. June 1759; Amoen. Acad. 4: 306. Nov. 1759 ('*monnieria*'). *Moniera cuneifolia* Michaux, Fl. Bor. Am. 2: 22. 1803 ('*monniera*'); Gamble, Fl. Madras 953(669). 1923.

Prostrate with ascending branches. Leaves sessile, entire, oblong or obovate, to 2.5 × 0.6 cm; veins obscure. Flowers solitary, axillary, pedicelled. Corolla campanulate, white to lilac. Stigma capitate. Capsule ovoid, apiculate, with persistent style.

Tropics. Frequent in wet or marshy places in plains. January-August. *CJS* 13214, *HFP* 1396.

Note: *Moniera* P. Browne (*nom. rejie.*) was established as a genus in March 1756. In June 1756 Linnaeus established *Lysimachia monnieri* in Torner's thesis without reference to Patrick Browne based on a specimen collected by Hallman. In June 1759 Linnaeus apparently transferred this taxon to *Gratiola* (*G. monnieri*) in the 10th edition of the *Systema naturae* without reference to his earlier publication but citing "Brown, jam. p. 269." In November 1759 in the *Amoenitates academicae* Linnaeus maintained *Gratiola monnieri* clearly as a revision of Torner's thesis (still species number 120), but introduced a spelling change of the species epithet to *monnieria.* Thereafter, Linnaeus consistently used the altered spelling *monnieria.* Later workers (Fernald, *Rhodora* 37: 440. 1935) have adopted the altered spelling until Pennell (*l.c.*, 1946) pointed out the illegitimacy of Linnaeus' spelling change. Had Linnaeus changed the spelling of *monnieri* to *moniera,* the spelling originally used by Patrick Browne, the change would have been acceptable. But introducing a completely new spelling (*monnieria*) is capricious and unacceptable.

Some workers (Adams, *Fl. Pl. Jamaica* 664. 1972) consider Pennell's correction as a new combination dating from 1946. But Pennell is quite clear that he did not propose a new combination but only a return to the original Linnaean spelling. There is no indisputable evidence that *Lysimachia monnieri* and *Gratiola monnieri* are based on different types.

BUCHNERA Linnaeus

Hemiparasites. Flowers bibracteolate, sessile, 5-merous. Calyx tubular, 10-ribbed; lobes linear. Corolla salverform, almost straight; lobes subequal; upper lobe innermost in bud. Stamens 4, didynamous; anther 1-celled, mucronate. Fruit a loculicidal capsule.

Buchnera hispida Ham. ex D. Don, Prodr. Fl. Nepal. 91. 1825; Wight, Ic. t. 1413. 1849; Gamble, Fl. Madras 966(679). 1924.

Hispid herbs, black when dry. Lower leaves toothed, elliptic-lanceolate, to 4 × 1.5 cm; upper leaves linear-lanceolate, passing into bracts. Corolla purple.

Trop. Africa, India. Frequent among grasses across plains and upper Ghats. November-January. *CJS* 15883, *HFP* 1214.

CENTRANTHERA R. Brown

Hemiparasites. Flowers solitary, axillary or in terminal spike or raceme. Calyx subtended by 2 short bracteoles, spathaceous, split on one side, entire or 3-5-toothed. Corolla slightly ventricose, dilated above, obscurely 2-lipped; upper 2 lobes interior in bud. Stamens 4, didynamous; anther cells unequal, connivent, spurred; one cell usually imperfect. Fruit loculicidal capsule; seeds spirally ridged.

Centranthera indica (L.) Gamble, Fl. Madras 971(683). 1924. *Rhinanthus indica* L., Sp. Pl. 603. 1753. *Centranthera hispida* R. Br., Prodr. 438. 1810; Gamble, Fl. Madras 971(683). 1924.

Erect, scabrid herbs with conspicuous tubercles. Roots often deep orange. Stem 4-angled. Leaves entire-toothed, oblong-oblanceolate, to 3×0.5 cm. Flowers subsessile. Corolla brownish-purple. Staminal filaments usually ciliate. Capsule oblong.

Indomalaysia. Frequent in grasslands. September-November. *CJS* 15456, *HFP* 500.

DOPATRIUM Hamilton ex Bentham

Leaves opposite, crowded near base, remote and reduced toward apex. Flowers axillary; bracteoles 0. Calyx deeply 5-partite. Corolla dilated upward, 2-lipped; upper lip 2-lobed, exterior in bud. Stamens 2. Capsule loculicidal; seeds tuberculate or pitted.

Dopatrium junceum (Roxb.) Ham. ex Bentham, Scroph. Ind. 31. 1835; Gamble, Fl. Madras 954(670). 1923. *Gratiola juncea* Roxb., Pl. Cor. t. 129. 1800.

Fleshy herbs branching from base. Radical leaves elliptic-obovate, to 2.5×0.5 cm; cauline leaves ovate-lanceolate. Lower flowers sessile; upper on capillary, ascending, to 1.5 cm long pedicels. Corolla violet, 5 mm long. Capsule globose.

Indomalaysia. Frequent in water-logged areas and rice fields on plains. June-September. *CJS* 11090, *HFP* 2194.

GLOSSOSTIGMA Wight & Arnott *nom. cons.*

Minute, tufted herbs rooting at nodes. Flowers axillary, minute; bracteoles 0. Calyx campanulate, 3-4-lobed. Corolla tubular, slightly 2-lipped; upper lip exterior in bud. Stamens 2. Anther cells divergent. Stigma spatulate. Capsule loculicidal; seeds vertically ridged.

Glossostigma diandrum (L.) Kuntze, Rev. Gen. Pl. 461. 1891; Sant., Fl. Khandala ed. 3, 186. 1967. *Limosella diandra* L., Mant. Alt.

252. 1771. *Microcarpaea spathulata* W. Hooker, Bot. Misc. 2: 101, Suppl. t. 4. 1831. *Glossostigma spathulatum* (W. Hooker) Wight & Arn. ex Arn., Nov. Actorum Acad. Caes. Leop.-Carol. Nat. Cur. 18: 355. 1836; Gamble, Fl. Madras 964(677). 1924.

Leaves linear-spatulate, to 1 cm. Flowers pedicelled. Corolla pinkish-white. Capsule subglobose.

Paleotropics. Occasional on wet sandy soil across the plain. August-March. *CJS* 13091, *HFP* 754.

LIMNOPHILA R. Brown *nom. cons.*

Usually limnophytes. Leaves opposite to whorled. Corolla tubular with slightly spreading limb; upper lip exterior in bud. Stamens 4, didynamous; anthers cohering in opposite pairs; cells separate, stipitate. Style flexed at tip. Capsule 4-valved; placentiferous dissepiment seemingly winged, separating with valves. Seeds angular.

1 Leaves penninerved; submerged leaves not multifid.
2 Flowers subsessile ..... *L. repens*
2 Flowers pedicelled ..... *L. chinensis*
1 Leaves 3-ribbed; lower leaves multifid.
3 Flowers subsessile ..... *L. heterophylla*
3 Flowers pedicelled ..... *L. indica*

Limnophila chinensis (Osbeck) Merrill, Amer. J. Bot. 3: 581. 1916; Philcox, Kew Bull. 24: 151. 1970. *Columnea chinensis* Osbeck, Ostind. Resa 230. 1757. *Stemodia hirsuta* Heyne ex Bentham, Bot. Reg. 17: sub t. 1470, Sp. 15. 1832. *Limnophila hirsuta* (Bentham) Bentham in DC., Prodr. 10: 388. 1846; Gamble, Fl. Madras 951 (668). 1923.

Usually hirsute herbs. Leaves penninerved, elliptic-obovate, punctate, serrulate, to 3 × 1 cm; submerged leaves not dissected. Flowers axillary, pedicelled. Calyx striate, subtended by 2 bracteoles. Corolla tinged with purple.

Indomalaysia. Frequent in marshy areas of upper Ghats. August-February. *CJS* 9924, *HFP* 1219.

Limnophila heterophylla (Roxb.) Bentham, Scroph. Ind. 25. 1835; Gamble, Fl. Madras 952(668). 1923; Philcox, Kew Bull. 24: 124. 1970. *Columnea heterophylla* Roxb., Fl. Ind. 3: 97. 1832.

Emergent leaves mostly simple and lanceolate; submerged leaves multifid. Flowers in simple spikes, ebracteolate. Corolla pale pink.

Indomalaysia. Occasional across the plain. September-February. *CJS* 15664, *HFP* 757.

Note: This may prove to be conspecific with *L. sessiliflora* Blume. Philcox, however, regards the two as distinct species.

Limnophila indica (L.) Druce, Bot. Exch. Club Soc. Brit. Isles 3: 420. 1914; Philcox, Kew Bull. 24: 115. 1970. *Hottonia indica* L., Syst. Nat. ed. 10, 919. 1759. *Cyrilla aquatica* Roxb., Pl. Cor. t. 189. 1798. *Limnophila gratioloides* R. Br., Prodr. 442. 1810; Gamble, Fl. Madras 952(668). 1923. *Limnophila racemosa* Bentham, Scroph. Ind. 26. 1835; Wight, Ic. t. 861. 1844-1845; Gamble, Fl. Madras 952(668). 1923. *Limnophila aquatica* (Roxb.) Alston, Ann. Roy. Bot. Gard. (Peradeniya) 11: 205. 1929; Philcox, Kew Bull. 24: 129. 1970.

Stem villous, puberulous or glabrous. Leaves 3-nerved, punctate; emergent leaves serrulate to lobed; submerged leaves dissected. Flowers solitary, axillary or racemed; pedicels longer than calyx. Bracteoles 0 or 2. Corolla white throughout or limb tinged with purple.

Paleotropics. Frequent in tanks and marshes across the District. All seasons. *CJS* 12405, 15902.

Note: *L. indica* (L.) Druce and *L. aquatica* (Roxb.) Alston have often been considered as distinct species. However there are innumerable intermediate forms making a species delimitation extremely difficult. A phenological plasticity due to ecological variations might explain a number of intergrading forms. Natural hybridization cannot be ruled out. Until evidence other than that based on mere external morphology is available, the two extreme forms are being treated as conspecific. Our field observations indicate that the small, glabrous white-flowered plant called *L. indica* (L.) Druce grows in seasonal pools while the larger, hairy, purple-flowered plant called *L. aquatica* (Roxb.) Alston grows in more or less permanent pools.

Limnophila repens (Bentham) Bentham in DC., Prodr. 10: 387. 1846; Philcox, Kew Bull. 24; 154. 1970. *Stemodia repens* Bentham, Bot. Reg. 17: sub t. 1470, Sp. 11. 1832. *Stemodia sessilis* Bentham, Bot. Reg. 17: sub t. 1470, Sp. 8. 1832. *Limnophila conferta* Bentham in DC., Prodr. 10: 387. 1846; Gamble, Fl. Madras 951(667). 1923. *Limnophila sessilis* (Bentham) Fischer, Bull. Misc. Inform. 62. 1932.

Leaves elliptic-obovate, penninerved, punctate, not multifid. Flowers axillary, subsessile, 2-bracteolate. Corolla purple.

India, Burma, Sri Lanka. Occasional in marshes in lower Ghats. October-December. *CJS* 13400, 15904.

LINDERNIA Allioni

Stem 4-angled. Leaves pinnately or palmately veined. Bracteoles 0. Calyx not winged. Corolla 2-lipped; upper lip exterior in bud. Stamens 4, didynamous or 2 with 2 staminodes; anthers often cohering in pairs; cells usually divergent. Capsule exceeding calyx, septicidal; seeds pitted.

1 Leaves palmately 3-5-nerved.
2 Stamens 4.....*L. nummulariifolia*
2 Stamens 2; staminodes 2.

3 Fruiting pedicel to 1.5 cm long; corolla 5 mm long; lower leaves ovate, rounded at base ..... *L. parviflora*
3 Fruiting pedicels 2-4 cm long; corolla over 1 cm long; lower leaves lanceolate, acute at base ..... *L. hyssopoides*
1 Leaves penninerved.
4 Stamens 2; staminodes 2.
5 Leaf-serrations aristate ..... *L. ciliata*
5 Leaf-serrations distant, shallow ..... *L. antipoda*
4 Stamens 4, didynamous.
6 Mature capsule twice the length of calyx ..... *L. anagallis*
6 Mature capsule equaling or slightly exceeding calyx.
7 Flowering calyx cleft to less than half its length ..... *L. crustacea*
7 Flowering calyx cleft almost to base ..... *L. pusilla*

Lindernia anagallis (N. Burman) Pennell, J. Arnold Arbor. 24: 252. 1943; Philcox, Kew Bull. 17: 484. 1964. *Ruellia anagallis* N. Burman, Fl. Ind. 135. 1768. *Gratiola cordifolia* Colsm., Prodr. Descrip. Grat. 15. 1793. *Vandellia pedunculata* Bentham, Scroph. Ind. 37. 1835; Gamble, Fl. Madras 959(673). 1923. *Lindernia cordifolia* (Colsm.) Merrill, Enum. Philipp. Fl. Pl. 3: 437. 1923; Mukerjee, J. Indian Bot. Soc. 24: 132. 1945.

Decumbent herbs. Leaves shortly petiolate, ovate, obscurely serrate, truncate-cordate, to 1.5×1 cm. Pedicels axillary, to 3 cm. Corolla pink. Stamens 4; anterior filaments appendiculate. Fruiting calyx divided almost to base, less than half the length of the capsule.

Indomalaysia. Occasional in moist places in Ghats. *CJS* 14017, *HFP* 1698.

Lindernia antipoda (L.) Alston in Trimen, Handb. Fl. Ceylon 6: 214. 1931; Philcox, Kew Bull. 17: 484. 1964; Sant., Fl. Khandala ed. 3, 180. 1967. *Ruellia antipoda* L., Sp. Pl. 635. 1753. *Gratiola veronicifolia* Retz., Obs. Bot. 4: 8. 1786. *Ilysanthes veronicifolia* (Retz.) Urban, Ber. Deutsch. Bot. Ges. 2: 436. 1884 ('*veronicaefolia*'); Gamble, Fl. Madras 962(675). 1923.

Decumbent herbs. Leaves elliptic-lanceolate, distantly shallowly serrate, penninerved, to 3×0.5 cm. Flowers solitary or in bracteate racemes. Corolla blue-purple. Stamens 2; staminodes 2. Capsule more than twice the length of calyx.

Indomalaysia. Frequent in marshy rice-fields of upper Ghats and western plains. All seasons. *CJS* 15220, *HFP* 1681.

Lindernia ciliata (Colsm.) Pennell, Brittonia 2: 182. 1936; Sant., Fl. Khandala ed. 3, 180. 1967. *Gratiola ciliata* Colsm., Prodr. Descrip. Grat. 14. 1793. *Gratiola serrata* Roxb., Fl. Ind. 1: 140. 1820. *Ilysanthes serrata* (Roxb.) Urban, Ber. Deutsch. Bot. Ges. 2: 436. 1884; Gamble, Fl. Madras 962(673). 1923.

Leaves sessile, oblong, penninerved, to 2.5 × 0.5 cm; serrations aristulate. Flowers in terminal racemes. Corolla pinkish-white. Stamens 2; staminodes 2. Capsule more than twice the length of calyx.

Indomalaysia. Occasional in western plain and lower Ghats. August-November. *CJS* 14636, *HFP* 2211.

Lindernia crustacea (L.) F. v. Mueller, Syst. Census Austr. Pl. 97. 1882. *Capraria crustacea* L., Mant. 87. 1767. *Vandellia crustacea* (L.) Bentham, Scroph. Ind. 35. 1835; Wight, Ic. t. 863. 1845; Gamble, Fl. Madras 959(673). 1923.

Leaves petiolate, ovate, penninerved, to 1 × 0.7 cm. Calyx shallowly lobed. Stamens 4; anterior filaments appendiculate. Capsule obovate, slightly exceeding calyx.

Paleotropics. Common in open moist places across District. August-October. *CJS* 9284, 14635.

Lindernia hyssopoides (L.) Haines, Bot. Bihar & Orissa 635(666). 1922 ('*hyssopioides*'). *Gratiola hyssopoides* L., Mant. Alt. 174. 1771 ('*hyssopioides*'). *Ilysanthes hyssopoides* (L.) Bentham in DC., Prodr. 10: 419. 1846 ('*hyssopioides*'); Gamble, Fl. Madras 961(675). 1923.

Leaves linear-lanceolate, narrowed to base, palmately nerved. Pedicel to 4 cm long. Corolla over 1 cm long, white tinged with bluish-purple. Stamens 2; staminodes 2, glandular, clavate. Capsule elongated, deflexed.

India, Sri Lanka. Very common in marshy, harvested rice-fields across plains. August-March. *CJS* 11093, 12299.

Lindernia nummulariifolia (D. Don) Wettstein in Engl. & Prantl, Pflanzenfam. 4(3b): 79. 1891 ('*nummularifolia*'). *Vandellia nummulariifolia* D. Don, Prodr. Fl. Nepal. 86. 1825 ('*nummularifolia*'); Gamble, Fl. Madras 958(673). 1923. *Vandellia sessiliflora* Bentham, Scroph. Ind. 37. 1835; Gamble, *l.c.*

Erect. Leaves sessile, suborbicular, serrate, palmately 5-nerved. Pedicels 0-1 cm. Corolla white-pink. Stamens 4; anterior filaments appendiculate. Capsules elongated, elliptic.

India, Burma. Occasional in western plain and upper Ghats. April-October. *CJS* 15326, *HFP* 640.

Note: The plants are chasmogamous with pedicelled, pink flowers in April-May. During the heavy monsoon they are cleistogamous with tiny, white, sessile flowers and clusters of sessile capsules. Both types of flowers are sometimes found on the same plant. The chasmogamous form was named *L. nummulariifolia* and the cleistogamous form *L. sessiliflora* (Bentham) Wettst.

Lindernia parviflora (Roxb.) Haines, Bot. Bihar & Orissa 635(665). 1922. *Gratiola parviflora* Roxb., Pl. Cor. t. 203. 1811. *Ilysanthes parviflora* (Roxb.) Bentham in DC., Prodr. 10: 419. 1846; Gamble, Fl. Madras 961(675). 1923.

Leaves ovate, rounded at base, palmately 3-5-nerved. Pedicel to 1.5 cm. Corolla to 5 mm, white. Stamens 2; staminodes 2. Capsule elongated, slightly oblique at apex.

Trop. Africa to S. E. Asia. Frequent in moist places on eastern plain. August-March. *CJS* 15350, *HFP* 489.

Lindernia pusilla (Willd.) Boldingh, Zakfl. Landbouwster. Java 165. 1916; Merrill, Philipp. J. Sci. Bot. 11: 312. 1917; Schlecter, Bot. Jahrb. Syst. 56: 573. 1921; Philcox, Kew Bull. 22 : 41. 1968. *Gratiola pusilla* Willd., Sp. Pl. 1: 105. 1797. *Selago pusilla* Thunb., Prodr. Pl. Cap. 99. 1800. *Torenia hirta* Cham. & Schlectend., Linnaea 2 : 571. 1827. *Vandellia scabra* Bentham, Scroph. Ind. 36. 1835; Gamble, Fl. Madras 959(673). 1923. *Lindernia hirta* (Cham. & Schlectend.) Pennell, J. Arnold Arbor. 24: 250. 1943; Mukerjee, J. Indian Bot. Soc. 24 : 131. 1945.

Prostrate, hirsute herbs. Leaves sessile, ovate-suborbicular, crenate, penninerved. Flowers solitary, pedicelled. Corolla white with brown upper lip. Stamens 4. Capsule globose, equaling the deeply divided calyx.

Paleotropics. Common in moist, well drained, open places in western plain and upper Ghats. *CJS* 12950, 14018.

Note: There has been some doubt whether *Gratiola pusilla* Willd. and *Selago pusilla* Thunb. refer to the same species especially since the latter was supposed to have come from S. Africa. Pennell (*l.c.*) considered them distinct and proposed *Lindernia hirta* (Cham. & Schlectend.) Pennell to designate the Willdenow plant. Philcox (*l.c.*) has followed Rolfe (1883) in considering the Willdenow and Thunberg plants conspecific. He further suggests that Thunberg's plant did not come from S. Africa but rather from the Far East.

Boldingh's combination of *Lindernia pusilla* is illegitimate according to the Code. It is however listed in *Index Kewensis, Suppl.* 9 and accepted by Philcox.

MECARDONIA Ruiz & Pavon

Flowers axillary; bracteoles 2, at base of pedicel. Calyx deeply 5-partite; segments unequal. Corolla obscurely 2-lipped; upper lip exterior in bud. Stamens 4, didynamous; anther cells separate, stipitate. Capsule equaling calyx, septicidal; seeds reticulate.

Mecardonia procumbens (Miller) Small, Fl. Southeast U. S. 1065, 1338. 1903; Adams, Fl. Pl. Jamaica 663. 1972. *Erinus procumbens* Miller, Gard. Dict. ed. 8, No. 6. 1768. *Lindernia dianthera* Swartz, Prodr. Veg. Ind. Occ. 92.1788. *Bacopa procumbens* (Miller) Greenm., Publ. Field Columbian Mus., Bot. Ser. 2: 261. 1907; Edwin, Publ. Field Mus. Nat. Hist., Bot. Ser. 13(5B): 481. 1971. *Mecardonia dianthera* (Swartz) Pennell, Proc. Acad. Nat. Sci. Philadelphia 98: 87. 1940.

Leaves subsessile, crenate-serrate, ovate-lanceolate, to 1.5×0.7 cm. Pedicel to 1.3 cm long; bracteoles to 5 mm. Inner calyx lobes narrower. Corolla yellow.

Neotropics. Introduced and naturalized. Occasional in open moist places across plains and upper Ghats. March-October. *CJS* 10754, *HFP* 1436.

MICRARGERIA Bentham

Erect herbs. Leaves alternate above, opposite below. Flowers in upper leaf axils, bracteate, often spiciform. Calyx campanulate, 5-lobed. Corolla small, tubular-campanulate, obscurely bilipped; upper lip interior in bud. Stamens 4, didynamous; anther cells equal, sessile, all fertile. Ovary 2-locular, many ovulate. Capsule globose, small, loculicidal. Seeds many, cuneate-oblong.

Micrargeria wightii Bentham in DC., Prodr. 10: 509. 1846; Wight, Ic. t. 1417. 1849; Gamble, Fl. Madras 970(682). 1924.

Leaves highly dissected, filiform above. Flowers light pink. Capsules sessile.

South Deccan. Common in open, stony soil in eastern plain (scrub). September-January. *CJS* 16053, 17912.

PEDICULARIS Linnaeus

Hemiparasites. Bracteoles 0. Calyx tubular-spathaceous. Corolla 2-lipped; upper lip erect, hooded, interior in bud. Stamens 4, didynamous. Capsule loculicidal, beaked; seeds reticulate.

Pedicularis zeylanica Bentham, Scroph. Ind. 54. 1835; Wight, Ic. t. 1419. 1849; Gamble, Fl. Madras 972(683). 1924.

Pubescent. Leaves oblong, crenate, to 3×1.3 cm. Calyx to 1 cm long, deeply cleft; lobes crested. Corolla pink. Anther cells mucronate. Capsule oblique.

South India, Sri Lanka. On exposed grassy slopes of peaks above 1000 m. Collected once from Genkalbetta on October 9, 1969. *CJS* 15254.

SCOPARIA Linnaeus

Stem angled. Leaves punctate. Flowers axillary; bracteoles 0. Calyx deeply 4-partite. Corolla rotate, subregular; upper lobe exterior in bud; throat bearded. Stamens 4, equal. Capsule septicidal, 2-valved; seeds pitted.

Scoparia dulcis L., Sp. Pl. 116. 1753; Gamble, Fl. Madras 964(678). 1924.

Leaves elliptic-obovate, serrate, to 3.5 × 1 cm. Corolla white, 4-lobed. Anther cells divergent. Capsule subglobose.

Neotropics. Introduced and naturalized. Frequent in disturbed areas along roads. August-April. *CJS* 15134, *HFP* 1160.

SOPUBIA Hamilton ex D. Don

Hemiparasites. Calyx bibracteolate, 5-toothed or 5-lobed. Corolla obscurely bilipped; upper lip interior in bud. Stamens 4, didynamous; anther-cells cohering in pairs, divergent, unequal; one of each pair reduced to spur. Seeds striate or reticulate.

1 Lower leaves pinnatisect; calyx lobes linear, glabrous within; sterile anther cells acuminate ..... *S. delphiniifolia*
1' Lower leaves trifid; calyx lobes ovate, hairy within; sterile anther cells obtuse .. *S. trifida*

Sopubia delphiniifolia (L.) G. Don, Gen. Syst. 4: 560. 1837 ('*delphinifolia*'); Gamble, Fl. Madras 970(682). 1924. *Gerardia delphiniifolia* L. in Juslenius, Cent. I. Pl. 21. 1756 ('*delphinifolia*').

Lower leaves pinnatisect with filiform segments. Calyx lobes linear, glabrous within. Corolla white to purple, to 2 cm long. Sterile anther cell acuminate. Capsule oblong.

South India, Sri Lanka. Frequent in open grassy places on plain and upper Ghats. August-January. *CJS* 12001, 12333.

Sopubia trifida Ham. ex D. Don, Prodr. Fl. Nepal. 88. 1825; Gamble, Fl. Madras 970(682). 1924.

Leaves trifid with linear segments. Calyx lobes ovate, hairy within. Corolla yellow with purple center, to 1 cm long. Sterile anther cell obtuse. Capsule oblong, emarginate; seeds spirally reticulate.

Indomalaysia. Collected once in flower and fruit from the grassy slopes of Genkalbetta (1100 m) on October 9, 1969. *CJS* 15256.

STEMODIA Linnaeus *nom. cons.*

Stem woody at base. Calyx bibracteolate, deeply 5-partite. Corolla 2-lipped; upper lip exterior in bud. Stamens 4, didynamous; anther cells stipitate. Capsule 4-valved; seeds reticulate or punctate.

Stemodia viscosa Roxb., Pl. Cor. t. 163. 1802; Gamble, Fl. Madras 949(666). 1923.

Leaves sessile, obovate, lanceolate, auricled at base, serrate toward apex. Flowers axillary, pedicelled. Calyx lobes subsimilar. Corolla

blue. Capsule ovoid, equaling calyx; seeds faintly reticulate.

W. Asia, India. Occasional weed in fields across plain. December-March. *CJS* 11939, *HFP* 1432.

STRIGA Loureiro

Hemiparasites to parasites. Leaves linear, sometimes reduced to scales. Flowers subsessile, axillary or in terminal bracteate spikes. Calyx bibracteolate; tube ribbed; lobes 5, linear. Corolla hypocrateriform; tube incurved at or above the middle; limb bilipped; upper lip interior in bud, emarginate. Stamens 4, didynamous; anthers 1-celled. Capsule included, loculicidal; seeds striate.

1 Calyx tube 5-ribbed.
2 Stems usually purple; leaves reduced to scales.....*S. gesnerioides*
2 Stems green; leaves linear, green.....*S. densiflora*
1 Calyx tube 10-15-ribbed.
3 One calyx rib terminating at tip of each lobe; the rest terminating in the sinuses.....*S. asiatica*
3 Three calyx ribs terminating at tip of each lobe.....*S. angustifolia*

Striga angustifolia (D. Don) Sald., Bull. Bot. Surv. India 5: 70. 1963; Sant., Fl. Khandala ed. 3, 184. 1967. *Buchnera angustifolia* D. Don, Prodr. Fl. Nepal. 91. 1825. *Buchnera euphrasioides* auct. non Vahl, 1794: Bentham, Scroph. Ind. 41. 1835. *Striga euphrasioides* sensu Bentham, excl. basionym: Bentham, Companion Bot. Mag. 1: 364. 1836; Gamble, Fl. Madras 968(680). 1924.

Leaves green, linear, scabrid. Calyx ribs 15 or more; each lobe with 3 ribs terminating at its apex. Corolla white, exceeding calyx.

Indomalaysia. Frequent in open, well-drained grasslands across plain and upper Ghats. August-October. *CJS* 11131, 14654.

Striga asiatica (L.) Kuntze, Rev. Gen. Pl. 2: 466. 1891; Hepper, Rhodora 76: 46. 1974. *Buchnera asiatica* L., Sp. Pl. 630. 1753. *Striga lutea* Lour., Fl. Cochinch. 22. 1790; Gamble, Fl. Madras 968(680). 1924; Saldanha, Bull. Bot. Surv. India 5: 69. 1963.

Leaves linear, green, to 3 cm long. Calyx 10-15-ribbed; one rib reaching to tip of each lobe, others ending at sinus between lobes. Corolla white or yellow, sometimes pink.

Paleotropics. Fairly common in dry grasslands across plain and upper Ghats. May-October. *CJS* 11206, 13949.

Note: *Striga asiatica* (L.) Kuntze has been used to designate one or other species of this genus. *Buchnera asiatica* L., its basionym, was described from material said to come from Ceylon and China. Bentham remarked (*Companion Bot. Mag.* 1: 364. 1836) that Linnaeus applied this name to "all the *Strigae* he was acquainted with." Subsequently Bentham listed *Buchnera asiatica* L. *ex parte* under 4 different species of *Strigae* (DC., *Prodr.* 10: 502-

503. 1846). Later authors have differed considerably in their application of this binomial. Consequently Saldanha (*l.c.*) rejected it under Art. 69. F. N. Hepper (*l.c.*) has once again revived *Striga asiatica* (L.) Kuntze and lectotypified it on one of the five specimens on sheet 790/10 (Savage, *Cat.*) in the Linnaean Herbarium.

Striga densiflora (Bentham) Bentham, Companion Bot. Mag. 1: 363. 1836; Gamble, Fl. Madras 967(680). 1923. *Buchnera densiflora* Bentham, Scroph. Ind. 41. 1835.

Calyx ribs 5, running to apex of lobes. Corolla white, exserted.

Central & S. India. Frequent in open grasslands across the plain. August-October. *CJS* 9258, 15004.

Striga gesnerioides (Willd.) Vatke, Oesterr. Bot. Z. 11. 1875. *Buchnera gesnerioides* Willd., Sp. Pl. 3: 338. 1800. *Buchnera orobanchoides* R. Br. ex Endl., Flora 15: 388, t. 2. 1832. *Striga orobanchoides* (Endl.) Bentham, Companion Bot. Mag. 1: 361. 1836 ('*orobanchioides*'), *nom. illegit.*; Gamble, Fl. Madras 967(680). 1924.

Purple parasites with prominent haustorial connections. Leaves reduced to scales. Calyx ribs 5, obscure, running to apex of lobes. Corolla lilac.

Western India. Occasional in scrub at Channarayapatna (dry plain). August-October. Found on roots of *Lepidagathis* sp. *CJS* 11068, 14294.

TORENIA Linnaeus

Stem 4-angled. Bracteoles 0. Calyx 5-lobed, prominently ribbed or winged. Corolla 2-lipped; upper lip exterior in bud. Stamens 4, didynamous; anterior filaments appendiculate; anthers connivent in pairs; cells divergent. Capsule included, septicidal; seeds pitted.

1 Fruiting calyx ribbed; corolla 2-3 cm long..... *T. bicolor*
1 Fruiting calyx winged; corolla to 1 cm..... *T. lindernioides*

Torenia bicolor Dalzell, Hooker's J. Bot. Kew Gard. Misc. 3: 38. 1851; Gamble, Fl. Madras 957(672). 1923.

Procumbent herbs. Leaves ovate, serrate, subcordate, to 1.5 × 1.2 cm. Flowers solitary; pedicels 2-4 cm long. Calyx tubular, obliquely 2-lipped. Corolla 2-3 cm long, bilipped; upper lip purple; lower lip whitish. Capsule oblong, included in strongly ribbed calyx.

Western Ghats. Frequent in open wet places in Ghats. May-November. *CJS* 15528, *HFP* 1980.

Torenia lindernioides Sald., Bull. Bot. Surv. India 8: 129. 1966.

Suberect herbs. Leaves ovate, crenate-serrate, subcordate, to 1.5 × 1.3 cm. Flowers solitary; pedicel to 1 cm long. Calyx regular, winged. Corolla white tinged with pink. Capsule ellipsoid, included.

Western Ghats. Frequent in open sandy soil and stream beds in Ghats. March-June. *CJS* 12949, *HFP* 1680.

Note: This plant has often been considered a variation of *Lindernia crustacea* (L.) Mueller. We have studied both plants in the field and find them quite distinct in the structure of the flowering and fruiting calyx, the color of the corolla and in their flowering and fruiting period.

119. GESNERIACEAE

T. P. Ramamoorthy

Note: The Editors are grateful to B. L. Burtt (E) and L. E. Skog (U.S.) for reviewing the typescript.

Herbs, undershrubs or epiphytes. Leaves usually alternate, estipulate, simple, entire or crenate, usually pinnately veined. Inflorescence cymose or in pseudoracemes, bracteate. Flowers 5-merous, bisexual, pedicelled, usually irregular; bracteoles minute. Calyx lobes usually valvate. Corolla tube elongate or not; limb usually bilabiate; lobes equal or unequal. Stamens usually 4 and didynamous; staminodes occasionally present. Disc mostly annular. Ovary superior, inferior or half-inferior, usually 1-locular; ovules many, parietal; style simple, linear. Fruit a 2-valved. loculicidal or circumscissile capsule, rarely a berry. Seeds many, usually tuberculate.

1 Epiphytes rooting at nodes; seeds tipped by hairs at either end.....**Aeschynanthus**
1 Herbs or undershrubs, erect or subscandent; seeds not tipped by hairs.
2 Leaves radical, crowded toward base; stamens 4.....**Jerdonia**
2 Leaves cauline, alternate or opposite; stamens 2-4.
3 Leaves distinctly oblique at base, long acuminate.....**Rhynchoglossum**
3 Leaves subequal at base, not long acuminate.
4 Fruticose; leaves oblanceolate, considerably narrowed toward base.....
.....**Rhynchotechum**
4 Slender herb; leaves ovate-rounded; at least the lower ones cordate at base....
.....**Epithema**

AESCHYNANTHUS Jack *nom. cons.*

Epiphytes rooting at nodes. Leaves opposite, subsessile, entire, fleshy. Inflorescence generally cymose. Flowers irregular. Calyx lobed or partite; corolla elongate-ventricose; limb bilabiate; upper lip smaller, 2-lobed; lower larger, 3-lobed. Stamens 4, didynamous; staminode posterior or none. Disc annular. Ovary superior, stipitate, linear, 1-locular; stigma dilated. Capsule loculicidally 2-valved, linear. Seeds oblong, with hairs near the hilum and from tip.

Aeschynanthus perrottetii A. DC. in DC., Prodr. 9: 261. 1845; Gamble, Fl. Madras 985(692). 1924.

Fig. 97. GESNERIACEAE. *A. Rhynchoglossum notonianum*: habit; *Aa*, flower; *Ab*, flower dissected; *Ac*, anther. *B. Epithema carnosum* var. *hispidum*: flower. *C. Aeschynanthus perrottetii*: flower; *Ca*, fruit. *D. Jerdonia indica*: flower; *Da*, ovary in cross section; *Db*, fruit.

Leaves 9×2 cm, lanceolate, acuminate, narrowed at base; the nerves obscure. Flowers 4.5-5 cm long. Calyx narrowly 5-partite. Corolla red, glabrous without; lobes rounded, ciliate.

South W. India. Common on trees in upper Ghats. July-October. *CJS* 10147, 11153, *HFP* 684.

EPITHEMA Blume

Slender succulent herbs. Leaves palmately veined. Inflorescence a dense, capitate cyme, embraced by a spathaceous, complicate bract. Flowers irregular. Calyx campanulate; corolla bilabiate. Stamens 2; staminodes 2. Disc completely enclosing ovary. Ovary superior; stigma capitate. Fruit a circumscissile, globose capsule, enclosed in an accrescent calyx. Seeds ellipsoid, remaining in dehisced fruit for long time.

Epithema carnosum Bentham, Scroph. Ind. 57. 1835.

var. **hispida** C. B. Clarke in Fl. Brit. India 4: 369. 1884; Gamble, Fl. Madras 992(697). 1924. *Epithema ceylanicum* auct. non Gardner, 1846: Wight, Ic. t. 1354. 1848 ("*ceylanica*").

Leaves to 12×10 cm; lower alternate, long-petioled, ovate-rounded, cordate, crenate, glabrous or hairy; upper smaller, opposite, subsessile, subcordate, rounded. Flowers blue; ovary pubescent.

South W. India. Common during monsoon in clefts of tree trunks or rock crevices, in lower Ghats. August-September. *CJS* 14444, *HFP* 2035.

JERDONIA Wight

Scapigerous, villous herbs. Leaves entire. Racemes axillary; bracts small. Calyx lobes valvate, linear-lanceolate, glandular hairy. Corolla white, tinged with pink; tube gibbous, curved; limb bilabiate. Stamens 4; anterior filaments spurred. Ovary superior; stigma large, peltate. Capsule 2-loculicidal. Seeds tuberculate.

Jerdonia indica Wight, Ic. t. 1352. 1848; Gamble, Fl. Madras 991(696). 1924.

Petiole to 12 cm long; blade 9×6 cm, elliptic, cordate, densely ciliate along margin. Scape to 12 cm long. Flowers 2 cm long.

South W. India. Common on floor of semi-evergreen forests in Bisle Ghat. Flowers May-June; fruiting to September. *CJS* 11694, *HFP* 1670.

RHYNCHOGLOSSUM Blume

Succulent herbs. Leaves entire, oblique at base. Inflorescence

racemose. Flowers irregular. Calyx winged or not. Corolla tubular, bilabiate; lower lip larger, 3-lobed; upper emarginate. Stamens sometimes 2 with the lower pair reduced to staminodes. Ovary superior, glabrous; style tipped by capitate stigma. Capsule 2-valved. Seeds minute, ellipsoid, smooth.

Note: The original spelling *Rhinchoglossum* was changed by Blume (*Fl. Jav.* 1: 8. 1828) to *Rhynchoglossum*.

1 Calyx winged; stamens 4.....*R. notonianum*
1 Calyx not winged; stamens 2.....*R. obliquum*

Rhynchoglossum notonianum (Wall.) Burtt, Notes Roy. Bot. Gard. Edinburgh 24: 170. 1962. *Wulfenia notoniana* Wall., Tent. Fl. Nap. 46. 1826. *Klugia notoniana* (Wall.) A. DC. in DC., Prodr. 9: 276. 1845; Wight, Ic. t. 1353. 1848; Gamble, Fl. Madras 990(696). 1924.

Leaves 7×4.5 cm, oblique at the base. Flowers pedicelled; bracteoles linear. Calyx winged. Corolla blue. Stamens 4.

South W. India, Sri Lanka. Occasional in shade at lower Shiradi Ghat. September. *CJS* 14792.

Rhynchoglossum obliquum Bl., Bijd. 741. 1826; Gamble, Fl. Madras 990(696). 1924.

Calyx not winged. Stamens 2; staminodes 2.

Indomalaysia. Common in shade, along roads in lower Ghats. August-October. *CJS* 14640, *HFP* 541.

RHYNCHOTECHUM Blume

Subscandent undershrubs. Leaves entire. Inflorescence axillary, cymose; cymes collected into compound umbels. Flowers regular. Corolla 5-lobed, imbricate in bud, regular. Stamens 4, free. Ovary superior, incompletely 2-locular. Fruit a berry, in accrescent calyx.

Note: This is the original spelling. It was changed by Blume (*Fl. Java* 1: 8. 1828) to *Rhynchotoechum*.

Rhynchotechum permolle (Nees) Burtt, Notes Roy. Bot. Gard. Edinburgh 24: 39. 1962. *Isanthera permollis* Nees, Trans. Linn. Soc. London 17: 82. 1834; Wight, Ic. t. 1355. 1848; Gamble, Fl. Madras 992(697). 1924.

Leaves 20×5 cm, oblanceolate, glaucous-white beneath, shortly petioled. Flowers white. Sepals linear-lanceolate. Petals obovate. Seeds smooth.

South W. India, Sri Lanka. Common in shaded, well-drained spots in lower Shiradi Ghat. August-September. *CJS* 14221, *HFP* 2022.

120. OROBANCHACEAE

T. P. Ramamoorthy

Achlorophyllous root parasites with alternate scaly leaves. Flowers bisexual, irregular. Corolla tubular, curving, usually subequaly 5-lobed, imbricate. Stamens 4, epipetalous, didynamous; anthers 2-celled, connivent, one usually imperfect and spurred. Ovary superior, 1-locular; ovules numerous, on 2 intrusive and 2-branched parietal placentas; style simple, curving; stigma peltate. Fruit a 2-valved capsule, sometimes indehiscent, enclosed in calyx; seeds numerous.

1 Calyx spathaceous.....**Aeginetia**
1 Calyx 5-lobed, campanulate.....**Christisonia**

AEGINETIA Linnaeus

Stem simple or branching, subterranean portion sending out stolons simulating roots (with haustoria), which emit buds that grow into new individuals. Inflorescence racemose; sometimes flower solitary. Calyx spathaceous, split on the anterior side. Corolla tube constricted near tip of ovary, sub-bilabiate, widening into 5 subequal lobes.

Aeginetia indica L., Sp. Pl. 632. 1753; Wight, Ic. t. 895. 1844-1845; Gamble, Fl. Madras 974(685). 1924.

Plant generally dirty brown in color. Flower usually solitary, to 3.5 × 2.5 cm. Calyx pinkish, partly enclosing corolla tube. Corolla purple, with a touch of white near throat, glabrous.

Indomalaysia to Japan. Common in undergrowth of evergreen or deciduous forests, on roots of several plants. August-October. *CJS* 14795, *HFP* 466.

CHRISTISONIA Gardner

Stem short or elongate, sometimes branching. Scape of few-flowered racemes or spikes. Calyx 5-toothed. Corolla tube long-exserted, subequaly 5-lobed, ventricose.

1 Stem short; flower short-pedicelled, nearly sessile; calyx orange red; corolla bright yellow.....*C. bicolor*
1 Stem elongate; flower long-pedicelled; calyx whitish; corolla lobes pink with a white tube .....*C. tubulosa*

Christisonia bicolor Gardner, Calcutta J. Nat. Hist. 8: 159. 1847; Gamble, Fl. Madras 976(686). 1924. *Christisonia aurantiaca* Wight, Ic. t. 1486. 1849.

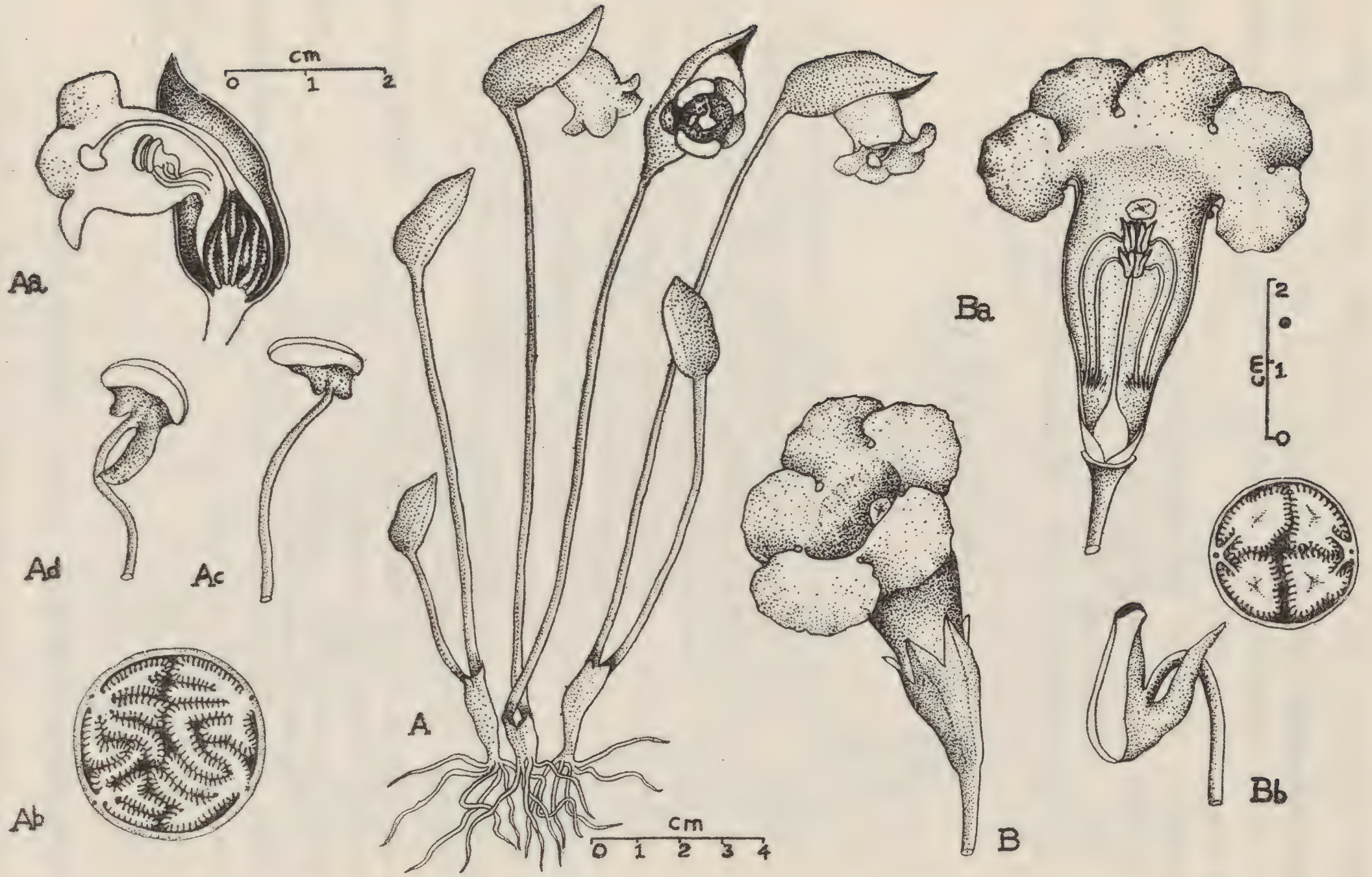


Fig. 98. OROBANCHACEAE. *A. Aeginetia indica*: habit; *Aa*, flower in section; *Ab*, ovary, cross section; *Ac*, *Ad*, stamens. *B. Christisonia tubulosa*: flower; *Ba*, flower, cut open; *Bb*, stamen.

Stem rather short, mostly underground, hairy, scaly. Flower 4-5 cm long, short-pedicelled. Calyx pink, hairy. Corolla tube white; lobes pink with yellow base, hairy.

South W. India, Sri Lanka. Occasional in undergrowth, usually on roots of *Nilgirianthus heyneanus*. July-August. *CJS* 14495, *HFP* 367. (Plate 7).

Christisonia tubulosa (Wight) Bentham ex J. Hooker, Fl. Brit. India 4: 321. 1884; Gamble, Fl. Madras 975(685). 1924. *Oligopholis tubulosa* Wight, Ic. t. 1422. 1849.

Stem elongate. Flowers long-pedicelled. Calyx white, 5-lobed, glabrous. Corolla tube white; lobes pink, whitish at base, glabrous.

South W. India. Occasional, on roots of different plants in wet deciduous forests. August-January. *CJS* 16152, *HFP* 1967. (Plate 8).

121. BIGNONIACEAE

K. N. Gandhi

Usually woody. Leaves usually opposite and odd-pinnate; stipules 0; venation pinnate. Inflorescence terminal, usually paniculate or corymbose. Flowers bisexual, irregular, showy. Calyx gamosepalous, usually campanulate, 5-lobed. Corolla gamopetalous, tubular-ventricose, usually 2-lipped; lobes 5, subequal, imbricate. Stamens usually 4, didynamous, included, often with a rudimentary staminode; anthers 2-celled, rarely 1-celled; cells usually divergent. Disc annular or cupular, fleshy. Ovary superior, usually 2-locular; ovules numerous, apparently axile; style included; stigma 2-lobed. Fruit usually an elongate, woody, bivalved capsule; seeds compressed, usually winged.

1 Leaves bipinnate; capsule strongly tuberculate without.....**Radermachera**
1 Leaves once-pinnate; capsule not tuberculate.
2 Leaflets distinctly serrate; anthers pubescent.....**Tecoma**
2 Leaflets entire or minutely crenulate or toothed; anthers glabrous.
3 Calyx spathaceous; capsule subterete.....**Dolichandrone**
3 Calyx tubular; capsule angled or winged.
4 Flowers white; capsule 2-winged.....**Pajanelia**
4 Flowers yellow; capsule 4-angled.....**Stereospermum**

DOLICHANDRONE (Fenzl) Seemann *nom. cons.*

Trees. Calyx closed in bud, later opening on one side and spathaceous. Capsule slightly compressed; seeds flat.

Dolichandrone atrovirens (Roth) Sprague, Bull. Misc. Inform. 304. 1919; Gamble, Fl. Madras 996(700). 1924. *Bignonia atrovirens* Roth, Nov. Pl. Sp. 284. 1821.

Fig. 99. BIGNONIACEAE. *A. Dolichandrone atrovirens*: twig; *Aa*, dissected flower; *Ab*, section of pistil; *Ac*, section of ovary; *Ad*, stamens. *B. Stereospermum personatum*: flower. *C. Radermachera xylocarpa*: fruit; *Ca*, seed.

Medium trees. Leaflets in 2-3 pairs with petiolules 1.5-2 cm, shortly caudate, oblique, 7-9×3-4 cm, coriaceous. Inflorescence a corymb. Calyx 3 cm long, with recurved point, leathery. Corolla white, 4-6 cm long. Anther cells divergent to parallel. Capsule arcuate, to 50 cm; seeds with membranous wings.

South India. Fairly common in scrub. March-December. *CJS* 13919, 16837.

PAJANELIA A. P. de Candolle

Trees. Inflorescence a panicle. Staminode present. Capsule compressed, 2-winged; seeds flat, with membranous wings.

Pajanelia longifolia (Willd.) K. Schum. in Engl. & Prantl, Pflanzenfam. 4(3b): 244. 1895. *Bignonia longifolia* Willd., Sp. Pl. 3: 306. 1800. *Pajanelia rheedii* Wight, Ic. t. 1343-44. 1848; Gamble, Fl. Madras 1000(702). 1924.

Tall, deciduous trees. Leaf axis to 100 cm long; leaflets in 12-14 pairs, 8-24×3-10 cm. Panicle 30-50 cm long. Calyx to 3×2 cm. Corolla to 8 cm long, white; lobes woolly-ciliate. Capsule 30-50×6-8 cm, brown.

India, Burma. Frequent in lower Bisle Ghat. January-March. *CJS* 13085, *HFP* 1467.

RADERMACHERA Zollinger & Moritzi

Trees. Calyx truncate or weakly lobed. Filaments hairy at base. Staminode present. Disc slightly ridged. Capsule subcylindric, strongly tuberculate without; septum cylindric, spongy, faintly-pitted; seeds flat, with hyaline wings.

Radermachera xylocarpa (Roxb.) K. Schum. in Engl. & Prantl, Pflanzenfam. 4(3b): 243. 1895; Gamble, Fl. Madras 999(702). 1924. *Bignonia xylocarpa* Roxb., Fl. Ind. 3: 108. 1832; Wight, Ic. t. 1335-36. 1848; Bedd., Fl. Sylv. t. 70. 1870.

Large, deciduous trees. Leaves bipinnate; pinnae 3 pairs, 10 cm long; leaflets to 4-9×2-4 cm. Inflorescence densely tomentose. Calyx 1 cm long. Corolla white, 3 cm long, glabrous. Capsule to 40×2.5 cm.

South India. Collected once in flower and fruit (of previous season) along Konnanur-Arkalgud road (plain) on February 21, 1970. *CJS* 16324.

STEREOSPERMUM Chamisso

Trees. Inflorescence panicled, lax. Calyx truncate or short-toothed.

Filaments often hairy at base. Disc cupular. Septum of capsule cylindrical, corky, pitted; seeds 2-winged, developing in septal cavities.

Stereospermum personatum (Hassk.) Chatterjee, Bull. Bot. Soc. Bengal 2(1): 70. 1948; Santisuk, Kew Bull. 28: 178. 1973. *Dipterosperma personatum* Hassk., Flora 25(2) Beibl.: 28. 1842. *Stereospermum tetragonum* A. DC. in DC., Prodr. 9: 210. 1845; Gamble, Fl. Madras 998(701). 1924. *Stereospermum chelonoides* auct. non (L. f.) DC.: Wight, Ic. t. 1341. 1848; Bedd., Fl. Sylv. t. 72. 1870.

Leaves once-pinnate; leaf axis 12 cm long; leaflets in 3-4 pairs, 5-9 $\times$2.5-4 cm, glabrescent. Panicle to 25 cm long. Calyx 0.6 cm long, unequaly and shortly lobed. Corolla yellow, sparsely pubescent, 2-3 cm long. Ovary tetragonal, slender. Capsule 4-angled, to 40$\times$0.5 cm.

India, Burma, Sri Lanka. Scattered across the Ghats. March-November. *CJS* 13658, *HFP* 1696.

TECOMA A. L. Jussieu

Shrubs or trees. Calyx campanulate, obscurely lobed. Filaments hairy at base; anther cells pubescent. Staminode short. Disc shortly cupular. Capsule linear, somewhat compressed; seeds with hyaline wing.

Tecoma stans (L.) Kunth in Humb., Kunth & Bonpl., Nov. Gen. Spec. 3: 144. 1819; Sant., Fl. Khandala ed. 3, 192. 1967. *Bignonia stans* L., Sp. Pl. ed. 2, 871. 1763. *Stenolobium stans* (L.) Seemann, J. Bot. 1: 88. 1863; Gamble, Fl. Madras 1000(703). 1924.

Leaves once-pinnate; axis 10 cm long; leaflets in 3-5 pairs, sessile, distinctly serrate. Raceme or panicle 9 cm long. Calyx 0.6 cm long. Corolla yellow, 5 cm long. Capsule 10-20 cm long.

Native of S. America. Often grown in gardens, as hedges and occasionally naturalized. Collected once in flower at Manjarabad Fort (upper Ghat) on January 28, 1969. *CJS* 12488.

* * *

Jacaranda acutifolia Humb. & Bonpl., *Kigelia pinnata* (Jacq.) DC., *Spathodea campanulata* Beauv. and *Tabebuia argentea* (Bur. & Schum.) Britt. are some of the ornamental trees found in towns and near Estate Bungalows.

122. ACANTHACEAE

T. P. Ramamoorthy

Erect or ascending, sometimes twining, occasionally prostrate, armed or unarmed herbs or shrubs. Leaves usually opposite, simple, usually entire, generally pinnately veined, mostly with cystoliths. Inflorescence various, usually bracteate, axillary, sometimes terminal; bracteoles generally 2. Flowers bisexual, irregular. Calyx 4-5-partite, sometimes 10-18-lobed, or minute and truncate, imbricate or valvate; corolla tubular, 2-lipped, sometimes the upper lip reduced or none, usually 2-lobed; the lower 3-lobed or corolla subequaly 5-lobed, imbricate in bud. Stamens 4, didynamous, sometimes 2, epipetalous, included or exserted; filaments often partially connate; staminodes present or absent; anther cells 1 or 2, if 2, parallel or inserted at unequal levels, spurred or not, sometimes hairy, dehiscing longitudinally. Disc present. Ovary superior, usually sessile on disc, 2-locular; ovules 2-many, axile; style elongate; stigma mostly unequaly bifid. Fruit a loculicidally 2-valved, elastically dehiscent capsule. Seeds 2-many, generally attached to upcurved supports (retinacula), usually compressed, mostly mucilaginous-hairy when wetted, sometimes pitted.

1 Leaves palmately veined.
2 Calyx 5-lobed ..... **Meyenia**
2 Calyx usually 10-18-fid, sometimes truncate ..... **Thunbergia**
1 Leaves pinnately veined.
3 Calyx 4-lobed.
4 Bracteoles in more than 3 decussate pairs, usually ending in acicular spinescent tips ..... **Blepharis**
4 Bracteoles usually 2, sometimes 0.
5 Calyx lobes unequal, with the inner two narrower; bracteoles sometimes 0 .... **Barleria**
5 Calyx lobes equal; bracteoles always present.
6 Plant unarmed ..... **Justicia**
6 Plant armed ..... **Hygrophila**
3 Calyx 5-lobed.
7 Stamens 4.
8 Bracts and bracteoles similar, ending in spinescent, pungent tips .... **Lepidagathis**
8 Bracts and bracteoles usually dissimilar, not spine-tipped.
9 Spikes or racemes secund ..... **Asystasia**
9 Spikes or racemes not secund.
10 Inflorescence a raceme, terminating stem; staminode usually present ..... **Staurogyne**
10 Inflorescence various, usually axillary and terminal; staminodes 0.
11 Anther cells mucronate or spurred at base ..... **Dyschoriste**
11 Anther cells entire at base.
12 Inflorescence 1-2-flowered ..... **Dipteracanthus**
12 Inflorescence more than 2-flowered.

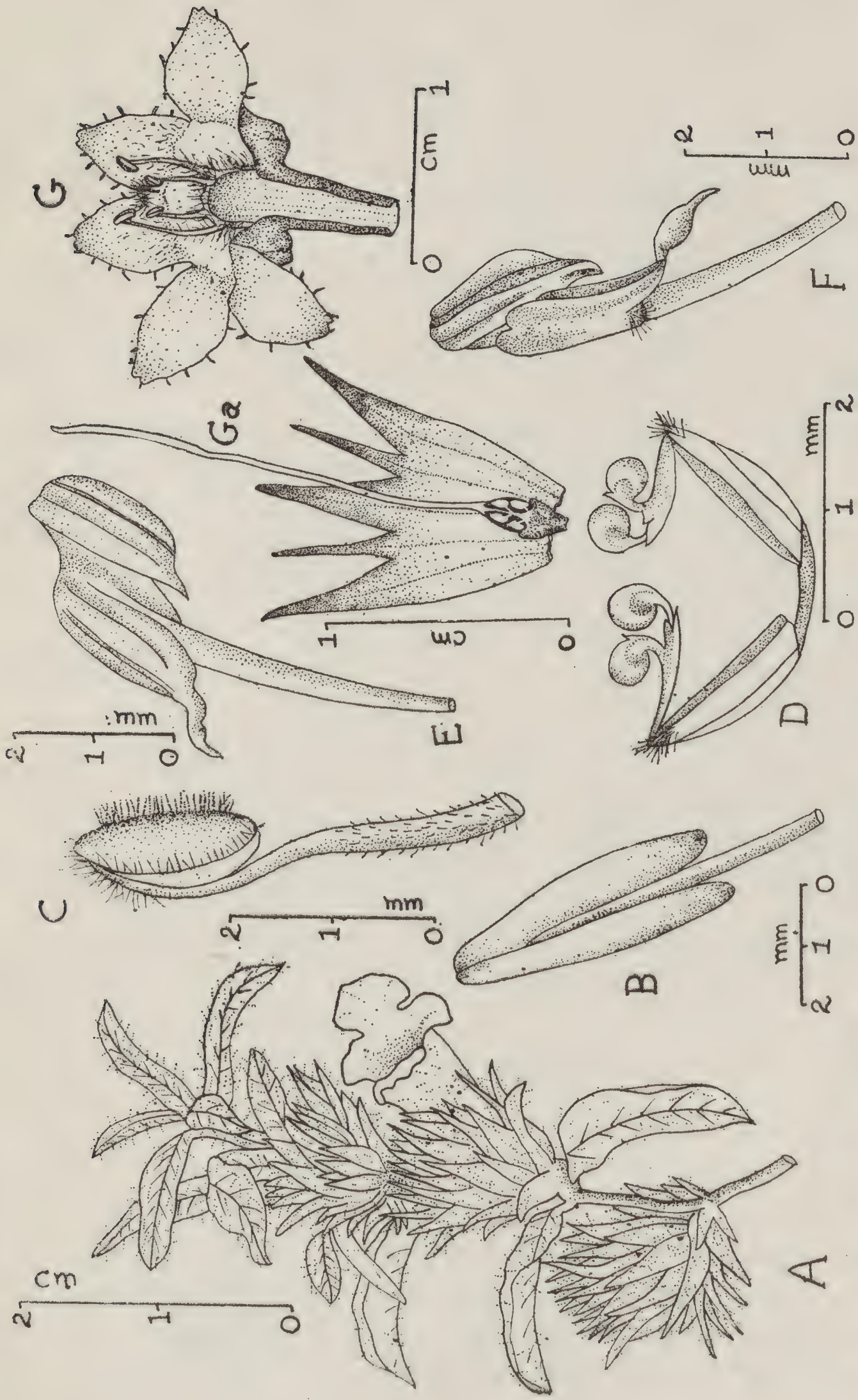


Fig. 100. ACANTHACEAE. *A. Lepidagathis cristata*: flowering branch. *B. Barleria courtallica*: anther. *C. Blepharis asperrima*: anther. *D. Rungia pectinata*: accrescent funiculus (retinaculum) of opening fruit. *E.* & *F. Justicia andersonii*: anthers. *G. Nilgirianthus barbatus*: *Ga*. Ovary with calyx, vertical section.

13 Bracts subtending 2-3 flowers; bracteoles 0.....**Phaulopsis**
13 Bracts subtending solitary flowers; bracteoles present.
14 Ovules more than 2 in each locule.
15 Spike capitate, peduncled.....**Hemigraphis**
15 Flowers clustered, sometimes solitary, sessile or subsessile.....**Hygrophila**
14 Ovules 2 in each locule.
16 Bracts. (the lower ones) broad, foliaceous, white-hairy toward base.....
.....**Xenacanthus**
16 Bracts not foliaceous, not white-hairy.
17 Bracts, bracteoles linear-oblong, obtuse, spatulate.....**Mackenziea**
17 Bracts, bracteoles various, but not spatulate.....**Nilgirianthus**
7 Stamens 2.
18 Anther cells placed at different levels, not parallel.
19 Anther cells spurred.
20 Inflorescence secund; placenta separating elastically.....**Rungia**
20 Inflorescence not secund; placentas not separating elastically.....**Justicia**
19 Anther cells not spurred.
21 Bracts flat, orbicular, clasping 2 (1 generally rudimentary) flowers....**Dicliptera**
21 Bracts otherwise, usually linear, clasping solitary flowers.
22 Corolla shorter than bracts.....**Peristrophe**
22 Corolla longer than bracts.....**Adhatoda**
18 Anther cells parallel.
23 Flowers subtended by abortive branchlets.....**Bremekampia**
23 Flowers not subtended by abortive branchlets.
24 Upper lip reduced, very small.....**Rhinacanthus**
24 Upper lip not reduced, developed.
25 Corolla tube, excluding limb, more than 2.5 cm long.
26 Bracts longer than calyx.....**Eranthemum**
26 Bracts shorter than calyx.....**Pseuderanthemum**
25 Corolla tube, excluding limb, less than 2 cm long.
27 Ovules 2 in each cell.....**Phlebophyllum**
27 Ovules 3-10 in each cell.
28 Capsule subterete; seeds compressed.....**Gymnostachyum**
28 Capsule compressed; seeds hardly compressed.....**Andrographis**

ADHATODA P. Miller

Erect shrubs, with branches thickened above nodes. Inflorescence of elongate, peduncled, spikes; bracts large, herbaceous; bracteoles narrower, longer than calyx. Calyx lobes 5. Corolla bilabiate; upper lip emarginate. Stamens 2, inserted near throat of corolla; staminodes 0; anther cells 2, placed at unequal levels, hastate or shortly spurred at base. Locules 2-ovuled; style simple, placed on a channel formed in corolla tube. Capsule stipitate; seeds usually rugose.

Adhatoda zeylanica Medic., Hist. & Commentat. Acad. Elect. Sci. Theod.-Palat. 6: 393. 1790. *Justicia adhatoda* L., Sp. Pl. 15. 1753; Adams, Fl. Pl. Jamaica 690. 1972. *Adhatoda vasica* Nees in Wall., Pl. As. Rar. 3: 103. 1832; Gamble, Fl. Madras 1082(758). 1924;

Sant., Bot. Mem. Univ. Bombay No. 2, 92. 1951; Backer & Bakh. f., Fl. Java 2: 588. 1965.

Shrubs to 1.5 m; young twigs pubescent. Petioles to 1 cm; blade 11-16×3.5-5 cm, ovate-lanceolate, acute-acuminate, narrowed below. Bracts to 2.5×1 cm, broadly elliptic, acute, pubescent; bracteoles narrower. Calyx lobes shorter than bracteoles, acute. Corolla white, 2.2-2.5 cm long, hairy without; middle lobe of lower lip largest.

Indomalaysia. In Hassan, usually grown as a hedge plant. January. *CJS* 12474.

ANDROGRAPHIS Wallich ex Nees

Erect, procumbent, sometimes trailing herbs; stem 4-angled. Inflorescence of lax racemes, sometimes these collected into panicles, occasionally flower solitary; bracts small; bracteoles often absent. Calyx deeply 5-partite; sometimes lobes unequal. Corolla usually 2-lipped. Stamens 2, exserted; filaments flat, hairy; anthers bearded at base or not. Ovary hairy or glabrous; locules 2-ovuled. Capsule oblong, linear, glabrous or hairy. Seeds usually rugose.

1 Prostrate herbs with stout rootstocks and orbicular-reniform leaves....*A. serpyllifolia*
1 Erect herbs; leaves not orbicular-reniform.
2 Anther not bearded at base.....*A. alata*
2 Anther bearded at base.....*A. lineata*

Andrographis alata (Vahl) Nees in DC., Prodr. 11: 516. 1847; Gamble, Fl. Madras 1049(735). 1924. *Justicia alata* Vahl, Enum. 1: 139. 1804.

Woody, spreading herbs. Leaves 3.5-6×1.2-2.5 cm, ovate-elliptic, acute at both ends, glabrous. Bracts ovate, acute. Calyx lobes ovate-lanceolate, glandular-hairy. Corolla white, to 1.5 cm long, obscurely 2-lipped; upper lip deeply divided. Anther glabrous. Capsule linear, glandular-hairy.

South W. India, Sri Lanka. Occasional in shade, on loose, moist sandy soil, often at base of rocks in the eastern plains (Nagpuri). October-November. *HFP* 1069, 1278.

Andrographis lineata Wall. ex Nees in Wall., Pl. As. Rar. 3: 116. 1832; Gamble, Fl. Madras 1049(735). 1924.

Erect herbs to 1.5 m. Leaves 2.5-5×1.5-2.5 cm, oblong, rounded at both ends, those above oblanceolate, glabrous or with few hairs above, generally drying black. Inflorescence axis and branches glandular-hairy; bracts ovate, acuminate; bracteoles narrower. Flowers pedicelled. Calyx glandular-hairy, unequal. Corolla to 1.5 cm, glandular-hairy without, white, sometimes pinkish; the upper lip 2-fid, acute; lower lip

sometimes with pink spots. Anthers bearded. Capsule linear, glandular-hairy.

South W. India. Common in Ghats, in and around thickets and occasionally in plains. September-October. *CJS* 14715, *HFP* 2300.

Note: This is apparently separable from *A. neesiana* Wt. which has longer pedicels and a denser inflorescence.

Andrographis serpyllifolia (Vahl) Wight, Ic. t. 517. 1841; Gamble, Fl. Madras 1051(736). 1924. *Justicia serpyllifolia* Rottler ex Vahl, Enum. 1: 169. 1804.

Prostrate herbs radiating from prominent rootstock; stem densely hairy. Leaves 1.2-1.6×2.2 cm, orbicular-reniform, glabrous. Raceme axillary, slender; flower often solitary; bracts minute. Calyx glandular-hairy. Corolla white, hairy, to 1.5 cm; lower lip with pink nerves. Capsule elliptic, glabrous.

Peninsular India. Common in plains, usually in open country. March-October. *CJS* 13433, *HFP* 599.

ASYSTASIA Blume

Subscandent undershrubs; stem thickened above nodes. Leaves petiolate. Inflorescence of axillary or terminal, spiciform, generally secund racemes; bracts and bracteoles small, similar. Calyx deeply 5-partite. Corolla tube opening into a 5-lobed limb; the lobes ovate or obovate, imbricate. Stamens 4, didynamous, included, sometimes the longer ones slightly exserted; anther cells parallel. Ovary globose, hairy, locule 2-ovuled; style hairy below. Capsule hairy, strongly stipitate, enclosing tuberculate, rugose seeds.

1 Twigs and leaves glabrescent; corolla less than 2 cm long.....*A. dalzelliana*
1 Twigs and leaves usually grey-pubescent; corolla more than 2 cm long.....*A. gangetica*

Asystasia dalzelliana Sant., Kew Bull. 3: 276. 1948. *Asystasia violacea* Dalzell ex C. B. Clarke in J. Hooker, Fl. Brit. India 4: 494. 1884, non Dalzell, 1850; Gamble, Fl. Madras 1063(745). 1924.

Twigs and leaves generally glabrescent, occasionally hairy. Leaves often long-petioled, generally membranous, 3-15×1-5.5 cm, elliptic-oblanceolate, sometimes ovate, acute-acuminate, cuneate below. Raceme solitary; flowers not approximate; bracts and bracteoles small, ovate, acute. Calyx hairy. Corolla white or blue, often purplish.

Western India, South of Bombay. Common in wet deciduous forests in upper Ghats and western plains, usually in partly shaded areas. July-October. *CJS* 14484, 14581, *HFP* 2617.

Note: Our specimens show variations in leaf margin and flower color and may include *A. crispata* Bentham.

Asystasia gangetica (L.) T. Anderson in Thwaites, Enum. 235. 1860; Gamble, Fl. Madras 1063(744). 1924. *Justicia gangetica* L. in Torner, Cent. II Pl. 3. 1756.

Herbs, usually grey-pubescent. Leaves 2-4.5 × 1-3 cm, ovate, acute, cordate-rounded, sometimes glabrescent. Raceme stipitate; bracts and bracteoles alike, ovate, acute. Calyx hairy. Corolla 3-3.5 cm long, hairy; tube white; limb campanulate, with pink lobes.

Africa, through Middle East to Indomalaysia. Fairly common in moist shaded places in plains. October-November. *CJS* 15365, 15559.

BARLERIA Linnaeus

Herbs or undershrubs, occasionally armed. Inflorescence of racemes, spikes, sometimes cymes or cincinni; bracts and bracteoles sometimes absent. Calyx of 4 lobes, lateral (inner) ones considerably narrower. Corolla tube elongate, widening into the 5-lobed limb. Stamens 2-4, if 2, often accompanied by small staminodes, inserted near base of corolla tube; fertile stamens partly exserted. Locules 1-2-ovuled. Capsules ovate-oblong, somewhat compressed, with usually hairy seeds.

1 Plant with intrapetiolar spines.....*B. buxifolia*
1 Plant without spines.
2 Calyx completely glabrous.....*B. prattensis*
2 Calyx hairy.
3 Flowers in terminal spikes.....*B. courtallica*
3 Flowers in axillary cincinni.....*B. involucrata*

Barleria buxifolia L., Sp. Pl. 636. 1753; Wight, Ic. t. 870. 1845; Gamble, Fl. Madras 1059(742). 1924.

Erect undershrubs to 0.75 m; spines to 1.2 cm, straight, white. Leaves sessile, to 1 × 0.8 cm, orbicular, spinous-tipped, hairy. Flower solitary. Bract and bracteoles 0 or spiny. Outer calyx lobes larger, elliptic, acute, spinoustipped, generally hairy. Corolla to 2.5 cm long, lobes rounded, purple. Stamens 2; staminodes 0.

Peninsular India. Common in open country and along roadsides in the plains, often on hard gravelly soil. September-March. *CJS* 12395, *HFP* 1428.

Barleria courtallica Nees in DC., Prodr. 11: 226. 1847; Wight, Ic. t. 1529. 1850; Gamble, Fl. Madras 1061(743). 1924.

Woody, erect, unarmed herbs, 2.5 m tall. Petiole 1-3.5 cm long; blade 7-21 × 2-7.5 cm, broadly elliptic, acuminate, cuneate, glabrous. Spikes rarely solitary; axis hairy; bract, bracteoles small. Outer calyx lobes to 2.2 × 1.8 cm, elliptic, acute, nervose, glandular-hairy; inner ones linear. Corolla 6 cm long; tube white; lobes broadly elliptic, purple, yellow at

base. Stamens 2, with 2 short staminodes at base.

South W. India. Common in shade, in wet deciduous to semi-evergreen forest undergrowth in Ghats. January-March. *CJS* 16274, *HFP* 1379.

Barleria involucrata Nees in Wall., Pl. As. Rar. 3: 92. 1832.

var. **elata** (Dalzell) C. B. Clarke in J. Hooker, Fl. Brit. India 4: 486. 1884; Gamble, Fl. Madras 1060(742). 1924. *Barleria elata* Dalzell, Hooker's J. Bot. Kew Gard. Misc. 3: 227. 1851.

Scandent shrubs to 2.5 m, unarmed, appressed-hairy. Petiole 1.5-5 cm; blade 10-16×3-6.5 cm, broadly elliptic, acuminate, cuneate. Flowers in simple cincinni; bracts and bracteoles linear-oblong. Outer 2 calyx lobes to 3.5×0.8 cm, ovate, acuminate, with yellow appressed hairs; inner ones narrower. Corolla to 10 cm long; lobes oblong-elliptic, blue, dark pink at base. Stamens 2, with 2 small stamens or staminodes below.

South W. India. Common along outskirts of wet deciduous to semi-evergreen forests, in thickets in Ghats. October-January. *CJS* 15489, *HFP* 964.

Barleria prattensis Santapau, Kew Bull. 3: 487. 1949; Bot. Mem. Univ. Bombay No. 2, 62. 1951. *Barleria gibsonii* sensu Gamble, Fl. Madras 1061(743). 1924 p.p., non Dalzell. *Barleria montana* sensu Bedd., Ic. t. 257. 1874, non Nees.

Woody, procumbent, erect herbs. Petiole 1.5-2 cm, glabrous; blade 6-10.5×2.5-4.5 cm, ovate, acute-acuminate, cuneate, glabrous, usually drying black. Flowers solitary; bracteoles linear. Outer calyx lobes to 3-5×1.5 cm, broadly elliptic, acute, glabrous, sometimes minutely hairy along margin, inner narrow, linear. Corolla to 8 cm long; lobes rounded, bright blue.

Western Maharashtra, Karnataka. Fairly common in dry deciduous forests, sometimes in open country, occasionally in upper, Ghats (Chikkanahalli). September-October. *CJS* 17881, *HFP* 2183.

Note: Our identification is tentative. *B. montana* which is closest to this differs in having larger, hairy seeds. Our collections lack fruiting materials.

BLEPHARIS A. L. Jussieu

Herbs, sometimes spinous. Leaves opposite, sometimes in whorls of 4, often unequal, sometimes toothed. Inflorescence of solitary flowers, few-flowered spikes or sometimes capitate; bracteoles 8-10, often with acicular spines. Calyx 4-lobed; outer 2 sometimes dissimilar. Corolla bilabiate with the upper lip obsolete. Stamens 4; anthers 1-celled, bearded

along margin. Locules 1-2-ovuled. Capsule 2-4-locular, with compressed, usually hairy seeds.

1 Leaves opposite.....*B. asperrima*
1 Leaves whorled.
2 Leaves membranous, glabrous-glaucous beneath.....*B. maderaspatensis*
2 Leaves thick, hairy beneath.....*B. repens*

Blepharis asperrima Nees in DC., Prodr. 11: 267. 1847; Wight, Ic. t. 1534. 1850; Gamble, Fl. Madras 1013(712). 1924.

Prostrate herbs with ascending branches; stem hairy. Leaf-blade 3-7 × 2-3 cm, ovate-lanceolate, acute-acuminate, crenulate, hairy. Flower solitary; bracteoles 8; third pair membranous tridentate, 4th spatulate. Outer calyx lobes 2-2.2 cm long, oblong-spatulate, acute, one of them bifid; inner linear, acute. Corolla to 1.8 cm, purple.

Western India. Common in shade or partially shaded areas on bunds of fields or outskirts of wet deciduous forests in upper Ghats. December-January. *CJS* 15917, *HFP* 1193.

Blepharis maderaspatensis (L.) Roth, Nov. Pl. Sp. 320. 1821; Sant., Bot. Mem. Univ. Bombay No. 2, 15. 1951. *Acanthus maderaspatensis* L., Sp. Pl. 639. 1753. *Blepharis boerhaviifolia* Pers., Syn. Pl. 2: 180. 1806; Wight, Ic. t. 458. 1841; Gamble, Fl. Madras 1013(712). 1924.

Prostrate herbs; stem hairy. Leaves whorled, sessile or shortly petioled 2.5-7.5 × 1-2.5 cm, oblong-lanceolate, acute-acuminate, cuneate, membranous, glaucous beneath. Flowers solitary or 2-4 together, axillary; bracteoles in 5 pairs, the largest near the tip, all with acicular spines; outer calyx lobes 1.8-2 cm, oblong, entire; inner linear. Corolla to 1.7 cm long, white.

Tropical Africa to Burma. Common in sandy, gravelly terrain, in shade of boulders and shrubs in eastern plains. November-January. *CJS* 15541, 16125.

Blepharis repens (Vahl) Roth, Nov. Pl. Sp. 321. 1821. *Acanthus repens* Vahl, Symb. 2: 76. 1791. *Blepharis molluginifolia* Pers., Syn. Pl. 2: 180. 1806; Gamble, Fl. Madras 1013(712). 1924.

Prostrate herbs; stem hairy. Leaves sessile, 1-3 × 0.2-0.4 cm, linear-oblong, coriaceous, hairy. Flower solitary; bracteoles 8, the largest at the top, all with acicular spines; outer calyx lobes to 0.8 cm long, one of them bifid at tip; inner linear. Corolla white.

India, Sri Lanka. Rare. Collected once near Channarayapatna, in open country. September. *CJS* 11074.

BREMEKAMPIA Sreemadhavan

Herbs. Inflorescence axillary, sometimes terminal, of pseudowhorls of flowers subtended by many abortive branchlets (cladodes); bracts and bracteoles small. Calyx lobes 5, exceeding bract. Corolla indistinctly 2-lipped. Stamens 2, included; anther cells 2, parallel; connective hairy on the back; staminodes 0. Locules 3-8-ovuled. Capsule oblong, 6-16-seeded; seeds hairy when wetted.

Bremekampia neilgherryensis (Wight) Sreem., Bull. Bot. Surv. India 6: 323. 1965. *Haplanthus neilgherryensis* Wight, Ic. t. 1556. 1850; Gamble, Fl. Madras 1052(737). 1924.

Herbs, to 35 cm. Leaves 4-16 × 1.5-3.5 cm, obovate, acute, cuneate, membranous, glabrous. Cladodes densely villous with soft hairs. Calyx lobes linear, acuminate, hairy on the back. Corolla blue, broadest at tip.

Western Peninsular India. Fairly common along roadsides and forest clearings in lower Bisle Ghat. January. *CJS* 12563, 16011.

DICLIPTERA A. L. Jussieu *nom. cons.*

Fruticose herbs. Leaves undulate. Inflorescence axillary, rarely terminal, generally a fascicle; bracts and bracteoles present. Flowers generally 2, one often rudimentary, clasped by 2, flat involucral bracts; bracteoles linear. Calyx lobes 5, like bracteoles. Corolla tube narrow, widening into the bilabiate limb. Stamens 2, usually exserted; staminodes none; anther cells 2, at unequal levels, not spurred. Locules 2-ovuled. Capsule stalked; seeds often tuberculate.

Dicliptera cuneata Nees in Wall., Pl. As. Rar. 3: 111. 1832; Wight, Ic. t. 1552. 1850; Gamble, Fl. Madras 1073(752). 1924.

Stem quadrangular, hairy. Leaf blade 3-7 × 1.2-3.2 cm, ovate-elliptic, sparsely hairy. Inflorescence of axillary clusters; floral bracts 2, unequal, flat, to 1.2 cm long, orbicular, narrowed at base, apiculate, hairy. Corolla pink, to 1.5 cm long, hairy without. Tubercles of seeds glochidiate.

Southern Peninsular India. Common along roadsides, edges of thickets and forests in upper Ghats. January-March. *CJS* 12530, 16401.

DIPTERACANTHUS Nees *emend.* Bremekamp

Herbs. Inflorescence axillary, of 1-2 flowers; bracts foliaceous, exceeding calyx; bracteoles small. Calyx lobes 5. Corolla 5-lobed. Stamens 4, didynamous, not exserted; anther cells 2, parallel, not spurred; staminode occasionally present. Locules 3-6-ovuled. Capsule clavate. Seeds compressed, usually hairy.

Dipteracanthus prostratus (Poir.) Nees in Wall., Pl. As. Rar. 3: 81. 1832; Sant., Bot. Mem. Univ. Bombay No. 2, 24. 1951. *Ruellia prostrata* Poir. in Lam., Encycl. 6: 349. 1804; Gamble, Fl. Madras 1017(714). 1924.

Procumbent herbs. Petiole hairy; blade 2.5-4.4×1-2.1 cm, ovate, acute, sparsely hairy. Flower axillary, solitary, subsessile; bracts foliaceous, to 1×0.5 cm, ovate. Calyx lobes lanceolate, acute, hairy. Corolla lilac, externally hairy, to 1.5 cm, segmented into 5 semi-orbicular lobes. Staminodes 0. Seeds flat, discoid.

Central & Peninsular India. Collected once at Nagpuri in flower. July. *CJS* 13942.

DYSCHORISTE Nees

Herbs or undershrubs. Leaves sometimes shortly dentate. Inflorescence axillary, of fascicles or of branching, peduncled cymes; bracts and bracteoles small. Calyx lobes 6. Corolla 5-lobed, not manifestly 2-lipped. Stamens 4, didynamous; anther cells 2, parallel, often minutely spurred at base. Ovary glabrous; locules 2-ovuled. Capsule oblong, stipitate. Seeds compressed, hairy when wetted.

1 Prostrate herbs; flowers in fascicles.....*D. erecta*
1 Erect herbs; flowers in branching, peduncled cymes.....*D. vagans*

Dyschoriste erecta (N. Burman) Kuntze, Rev. Gen. Pl. 485. 1891; Sant., Bot. Mem. Univ. Bombay No. 2, 31. 1951. *Ruellia erecta* N. Burman, Fl. Ind. 135, t. 41, fig. 3. 1768. *Dyschoriste depressa* Nees in Wall., Pl. As. Rar. 3: 81. 1832; Gamble, Fl. Madras 1023 (718). 1924.

Prostrate, glabrescent herbs. Leaves to 1.5×1 cm, ovate-oblong, sometimes rounded. Flowers fascicled. Calyx lobes glabrous. Corolla blue. Anthers slightly spurred.

Central & Peninsular India, Sri Lanka. Fairly common in open countrysides, bunds of fields in plains and upper Ghats. April-August. *CJS* 8836, 9536.

Dyschoriste vagans (Wight) Kuntze, Rev. Gen. Pl. 486. 1891; Gamble, Fl. Madras 1023(718). 1924. *Calophanes vagans* Wight, Ic. t. 1526. 1850.

Erect, pubescent herbs. Leaf blade 2-5×1-2.5 cm, ovate, acute. Inflorescence of peduncled, branching cymes. Calyx lobes acuminate. Corolla purple.

Central & Peninsular India. Collected once in a deciduous forest near Magge. December. *CJS* 15881.

ERANTHEMUM Linnaeus

Fruticose herbs. Inflorescence of spikes, often dense; bracts longer than calyx; bracteoles smaller, shorter than calyx. Calyx of 5 equal lobes, nearly scarious. Corolla tube elongate, 5-lobed; lobes usually equal, sometimes the posterior 2 smaller. Stamens 2, exserted or included; staminodes 2, sometimes 0; anther cells 2, parallel. Ovary often hairy at tip; locules 2-ovuled; longer than stamens. Capsule clavate, usually with 4 mucilaginous hairy seeds.

Eranthemum capense L., Sp. Pl. 9. 1753.

var. **concanense** (C. B. Clarke) Sant., Bot. Mem. Univ. Bombay No. 2, 34. 1951. *Eranthemum montanum* Roxb. var. *concanense* C. B. Clarke in J. Hooker, Fl. Brit. India 4: 421. 1884; Gamble, Fl. Madras 1025(720). 1924.

Leaf blade 7-14×3-5 cm, elliptic, acuminate, cuneate, glabrous. Inflorescence of interrupted spikes, these paniculate; bracts 1.8×0.3 cm, linear-oblong; bracteoles shorter; all glandular-hairy. Calyx lobes glandular-hairy, ovate, acuminate. Corolla white; tube to 3 cm long, not widened at tip, hairy. Stamens 2, exserted: staminodes 0.

Western India, South of Bombay to Coorg. Locally common in shade of semi-evergreen forests, on the banks of river Kempuhole in lower Shiradi Ghat and occasional in lower Bisle Ghat. December-February. *CJS* 15988, 16212.

GYMNOSTACHYUM Nees *emend.* Bentham

Herbs or undershrubs; stem often thickened above nodes. Leaves sometimes radical. Inflorescence usually axillary, of cymes or panicles of narrow racemes; bracts and bracteoles small. Calyx of 5, equal or subequal lobes. Corolla tube widening towards limb, more or less curved; limb bilabiate. Stamens 2, sometimes exserted; staminodes 0; anther cells 2, parallel, glabrous or hairy. Ovary sometimes hairy; locules 6-many-ovuled. Capsule linear.

Gymnostachyum latifolium (Dalzell) T. Anderson, J. Linn. Soc., Bot. 9: 505. 1867; Bedd., Ic. t. 253. 1874; Gamble, Fl. Madras 1053 (738). 1924. *Cryptophragmium latifolium* Dalzell, Hooker's J. Bot. Kew Gard. Misc. 2: 137. 1850. *Phlogacanthus latifolius* Wight, Ic. t. 1537. May 1850.

Undershrubs. Petiole 6-16 cm long, glaucous when young; blade 12-20×12-16 cm, broadly ovate-orbicular, acute at apex, rounded to subcordate at base, glabrous. Inflorescence an axillary panicle of racemes;

bracts ovate, acuminate; bracteoles smaller. Calyx lobes ovate, acuminate. Corolla greenish yellow, to 2 cm long, glabrous; lobes short, rounded. Stamens 2, exserted. Capsule linear, with compressed seeds.

South W. India. Common in lower Ghats, along streams in shade of wet deciduous and semi-evergreen forest undergrowth. November-April. *CJS* 12134, 12609.

Note: Gymnostachyum febrifugum Bentham has been collected over the border in South Kanara District, at Shiradi Ghat, and can be expected in the Hassan District in lower Ghats. It is distinguished from *G. latifolium* by its subradical leaves, by the leaf blade being decurrent on to the petiole and its general habit.

HEMIGRAPHIS Nees

Herbs. Inflorescence of pedunculate, capitate spikes; bracts foliaceous, larger than calyx; bracteoles present or absent. Calyx of 5 unequal lobes. Corolla funnel-shaped or ventricose, of 5 subequal lobes. Stamens 4, generally included; anther cells 2, acute below; staminodes 0. Locules 2-3-ovuled. Capsule usually elongate; seeds compressed, hairy when wet.

Hemigraphis latebrosa (Roth) Nees in DC., Prodr. 11: 723. 1847; Wight, Ic. t. 1504. 1850; Gamble, Fl. Madras 1018(715). 1924. *Ruellia latebrosa* Heyne ex Roth, Nov. Pl. Sp. 307. 1821.

Procumbent, pubescent herbs. Leaf blade 3-5×2.5-1.4 cm, ovate, crenate. Bracts to 0.8×0.2 cm, foliaceous; bracteoles 0. Calyx lobes shorter, unequal, lanceolate. Corolla blue, 1.5 cm long; lobes rounded. Staminal filaments hairy. Ovary hairy at tip. Capsule oblong, pubescent, 4-angled.

Central & Peninsular India. Common in lower Ghats, along roadsides and in shade along edges of semi-evergreen forests. October-January. *CJS* 12610, 15393.

HYGROPHILA R. Brown

Herbs, sometimes armed. Inflorescence axillary, of sub-sessile whorls or of 1-many flowers, rarely in terminal heads; bracts, bracteoles large, often covering calyx. Calyx lobes 4-5-partite. Corolla bilabiate. Stamens 4, didynamous, included; anther cells 2, parallel; staminodes 0. Locules 4-many-ovuled. Capsule oblong-linear; seeds compressed, hairy when wet.

1 Plants armed; calyx 5-partite; locules 4-ovulate.....*H. auriculata*
1 Plants unarmed; calyx 4-partite; locules many-ovulate.....*H. salicifolia*

Hygrophila auriculata (K. Schum.) Heine, Kew Bull. 16: 172. 1962. *Barleria longifolia* L. in Torner, Cent. II Pl. 22. 1756 [non *Hygrophila*

longifolia Nees 1847]. *Barleria auriculata* K. Schumacher, Besk. Guin. Pl. 285. 1827. *Asteracantha longifolia* (L.) Nees in Wall., Pl. As. Rar. 3: 90. 1832.

Frutescent herbs with axillary spines. Leaves in spurious whorls of 6, the outermost the longest, to 9×1 cm, lanceolate, hairy. Flowers in axillary whorls, often surrounded by thorns. Bracteoles linear. Calyx 4-partite, unequal. Corolla blue, glabrous, to 2.5 cm; lobes rounded to acute. Locules 4-ovuled.

India, Sri Lanka. Common around ponds and in marshes in plains and upper Ghats. October-April. *CJS* 11934, 12177.

Hygrophila salicifolia (Vahl) Nees in Wall., Pl. As. Rar. 3: 81. 1832; Wight, Ic. t. 1490. 1849; Sant., Bot. Mem. Univ. Bombay No. 2, 20. 1951. *Ruellia salicifolia* Vahl, Symb. 3: 84. 1794. *Hygrophila angustifolia* auct. non R. Br.: Cooke, Fl. Bombay 354(430). 1902; Gamble, Fl. Madras 1016(713). 1924.

Unarmed herbs. Leaves 6-16×0.6-2.5 cm, linear-elliptic. Flowers in axillary whorls; bracts and bracteoles oblong-acute, hispid-ciliate; calyx 5-partite, lanceolate, hispid-ciliate. Corolla 2 cm long, sparsely hairy, purple to blue. Locules many-ovuled.

Throughout India, Sri Lanka. Common in western plains and Ghats, in marshes, along cultivated fields and streams. October-December. *CJS* 15908, *HFP* 2493.

JUSTICIA Linnaeus

Herbs or shrubs. Inflorescence of spikes, panicles, sometimes cymes; occasionally flower solitary; bracts and bracteoles similar or dissimilar, sometimes the latter absent. Calyx of 4-5 imbricate lobes. Corolla 2-lipped, lobes induplicate-valvate. Stamens 2, with filaments usually dilated below; anther cells 2, at unequal levels, usually spurred below. Locules 2-ovuled. Capsule obovoid or globose, hairy or not; seeds tuberculate, echinate.

1 Calyx 4-lobed.
2 Cystoliths along leaf margin transversally oriented ..... *J. neesii*
2 Cystoliths irregularly oriented throughout ..... *J. simplex*
1 Calyx 5-lobed.
3 Flower large, more than 2.5 cm across ..... *J. andersonii*
3 Flower small, less than 1.5 cm across.
4 Bracts and bracteoles foliaceous, membranous, veined ..... *J. betonica*
4 Bracts and bracteoles otherwise.
5 Flowers in cymes ..... *J. glabra*
5 Flowers in spikes.
6 Sepals and axis of inflorescence glandular-hairy ..... *J. wynaadensis*
6 Sepals and axis of inflorescence pubescent ..... *J. nilgherrensis*

Justicia andersonii Ramam. *nom. nov.* *Justicia montana* (Nees) Wall. ex T. Anderson, J. Linn. Soc., Bot. 9: 509. 1867, non Roxb. 1805; Gamble, Fl. Madras 1078(725). 1924; Sant., Bot. Mem. Univ. Bombay No. 2, 85. 1951. *Hemichoriste montana* Nees in Wall., Pl. As. Rar. 3: 102. 1832.

Large undershrubs. Leaves 15-30×6-9 cm, oblanceolate. Inflorescence a panicle of racemes; bracts and bracteoles similar, ovate, acute. Calyx lobes 5, lanceolate, acuminate. Corolla to 2.5 cm long, white.

South W. India. Common in upper Ghats along edges of wet deciduous forests. January-February. *HFP* 1346, 2672.

Justicia betonica L., Sp. Pl. 15. 1753; Gamble, Fl. Madras 1078(755). 1924.

Erect or scandent undershrubs. Leaves 6-14×2-6 cm, ovate-elliptic. Spike short or long, with white, foliaceous, membranous, ovate-lanceolate, acuminate, veined bracts and bracteoles. Calyx 5-lobed. Corolla to 1.5 cm, white, with pink patches; nerves on corolla hairy. Staminal filament sheath hairy.

Tropical Africa, India, Sri Lanka, Malaya. Common in plains and Ghats, in open country, roadsides and along ditches, hedges. September-April. *CJS* 10178, 11979, *HFP* 2104.

Justicia glabra Koenig ex Roxb., [Hort. Beng. 4. 1814, *nom.*] Fl. Ind. 1: 132. 1820; Gamble, Fl. Madras 1080(756). 1924. *Rhapidospora glabra* (Roxb.) Nees in Wall., Pl. As. Rar. 3: 115. 1832; Wight, Ic. t. 1554. 1850.

Erect herbs. Leaves to 3×1.5 cm, ovate-acuminate, glabrescent. Inflorescence of axillary cymes; bracts and bracteoles minute, linear. Calyx 5-lobed. Corolla 0.5-0.6 cm long, white, hairy without.

South W. India, Sri Lanka. Occasional, collected only once around outskirts of Konanur, in open *Sorghum* fields. April. *CJS* 16734.

Justicia neesii Ramam. *nom. nov.* *Justicia micrantha* Wall. [List 2449. 1830, *nom.*] ex C. B. Clarke in J. Hooker, Fl. Brit. India 4: 536. 1885, non Pohl ex Nees. 1847; Gamble, Fl. Madras 1080(756). 1924; Sant., Bot. Mem. Univ. Bombay No. 2, 87. 1951. *Rostellularia crinita* Nees in Wall., Pl. As. Rar. 3: 101. 1832 [non *Justicia crinita* Thunb.].

Erect herbs. Leaves 1.5-3.5×0.8-2 cm, elliptic-rounded, with cystoliths transversely oriented toward margin. Flowers in spikes; bracts and bracteoles similar to calyx lobes, with white bulbous-based hairs along margin. Calyx 4-lobed; lobes scarious along margin. Corolla pink, 0.6 cm across.

South W. India. Common in plains and Ghats, in open country on moist loose soil, in shade along outskirts of wet deciduous forests, often in

cardamom estates. February-August. *CJS* 14435, *HFP* 257.

Justicia nilgherrensis (Nees) Wall. [List. 2435. 1830, *nom.*] ex T. Anderson, J. Linn. Soc., Bot. 7: 118. 1863; Gamble, Fl. Madras 1079(755). 1924. *Adhatoda nilgherrensis* Nees in Wall., Pl. As. Rar. 3: 103. 1832; Wight, Ic. t. 1544. 1850.

Woody herbs, branches creeping and ascending. Leaves sessile, to 2.5×0.4 cm, linear-lanceolate. Spikes few-many-flowered; bracts and bracteoles similar. Calyx lobes 5, lanceolate-acuminate. Corolla 0.6-0.8 cm long, white.

Nilgiris and now Hassan. Rare, collected once in flower and fruit in open grassy slopes near Byrapura. June. *HFP* 1719.

Justicia simplex D. Don, Prodr. Fl. Nepal. 118. 1825; Gamble, Fl. Madras 1080(756). 1924.

Creeping and ascending herbs. Leaves subsessile, 1-4×0.5-1.8 cm, ovate-linear, with cystoliths irregularly oriented. Spikes many-flowered; bracts broad, scarious along margin; bracteoles similar but narrower. Calyx lobes 4, bracteole-like, strongly nerved; nerves and margin hairy. Corolla 0.6 cm long, usually pink, sometimes white.

E. Africa, India, Malaysia. Common on bunds of cultivated fields, irrigation canals, along road-cuts and in open places. All seasons. *CJS* 11354, *HFP* 2118.

Note: This is similar to *J. procumbens* L. which is distinguished by its linear bracts and bracteoles.

Justicia wynaadensis (Nees) T. Anderson, J. Linn. Soc., Bot. 9: 515. 1867; Gamble, Fl. Madras 1080(755). 1924. *Gendarussa wynaadensis* Nees in Wall., Pl. As. Rar. 3: 104. 1832. *Adhatoda wynaadensis* (Nees) Nees in DC., Prodr. 11: 406. 1847; Wight, Ic. t. 1545. 1850.

Scandent herbs. Leaves 8-14×2-4.5 cm, elliptic-lanceolate. Spikes many-flowered; bracts and bracteoles linear. Calyx lobes 5, bracteole-like. Corolla 1 cm long, white, tinged with purple.

South W. India. Common in thickets along the outskirts of wet deciduous or semi-evergreen forests in Ghats. January-February. *CJS* 12512, *HFP* 1288.

LEPIDAGATHIS Willdenow

Fruticose herbs; stem thickened along nodes. Inflorescence of spikes, sometimes capitate; bracts and bracteoles similar, spinescent. Calyx lobes ending in a sharp mucro, unequal; the 2 anterior usually connate basally; the inner 2 smaller than the rest. Corolla bilabiate. Stamens 4, inserted at base of corolla tube, not exserted; anther cells 2, equally or unequally

placed, sometimes hairy on the back. Locules 2-ovuled. Seeds compressed, hairy.

1 Spikes clustered at base of stem.....*L. cristata*
1 Spikes not clustered at base of stem.....*L. incurva*

Lepidagathis cristata Willd., Sp. Pl. 3: 400. 1800; Wight, Ic. t. 455. 1841; Gamble, Fl. Madras 1066(747). 1924.

Creeping from a stout rootstock. Leaves to 2.5×0.8 cm, linear-oblong, glabrous. Spikes capitate, mostly crowded on lower nodes. Bracts pubescent, white-margined, spinescent. Calyx lobes bract-like with a short spine. Corolla hairy, white; lower lip with middle lobe larger and pinkish. Anther cells unequally placed, hairy along dehiscing lines.

Central & Eastern Peninsular India. Common in gravelly terrain in the eastern plains. All seasons. *CJS* 13815, *HFP* 1262.

Lepidagathis incurva D. Don, Prodr. Fl. Nepal. 119. 1825.

var. **mucronata** (Nees) C. B. Clarke ex Cooke, Fl. Pres. Bombay 2: 397. 1904; Sant., Bot. Mem. Univ. Bombay No. 2, 74. 1951. *Lepidagathis mucronata* Nees in Wall., Pl. As. Rar. 3: 95. 1832. *Lepidagathis hyalina* var. *mucronata* (Nees) C. B. Clarke in J. Hooker, Fl. Brit. India 4: 521. 1885; Gamble, Fl. Madras 1068(748). 1924.

Erect herbs. Leaves 5-10×2-3.5 cm, obovate, long-tapered to petiole, pubescent beneath. Spikes capitate and axillary. Bracts ovate-acute, spinescent, pilose-hairy. Calyx lobes bract-like. Corolla white with pink dots on lower lip, hairy without, less than 1 cm long.

South W. India. Common in Ghats, along edges of wet deciduous or semi-evergreen forests, in forest clearings and cardamom estates. December-March. *CJS* 16165, *HFP* 1289, 2613.

MACKENZIEA Nees

Shrubs or shrublets. Leaves petiolate or sessile. Inflorescence of spiciform racemes, sometimes condensed and capitate, rarely panicles. Bracts usually longer than calyx, nervose; bracteoles as long as or longer than calyx. Calyx 5-partite; corolla tube campanulate, 5-lobed. Stamens 4, didynamous, included; filaments usually hairy below; staminodes 0; pollen grains ellipsoid, lined or banded, the bands often with a wavy rib, not punctate. Ovary glabrous or hairy, 2-locular; ovules 2 in each locule. Capsule obovoid or oblong; seeds 2-4, hairy.

Mackenziea caudata (T. Anderson) Ramam. *comb. nov.* *Strobilanthes caudatus* T. Anderson in Thwaites, Enum. 228. 1860; Bedd., Ic. t. 213. 1874; Gamble, Fl. Madras 1041(729). 1924.

Shrubs reaching 3-4 m; twigs hairy. Petiole hairy; leaf blade 7-14× 2.5-3.5 cm, elliptic-lanceolate, caudate-acuminate, narrowed and rounded below, sparsely hairy; cystoliths lineolate. Raceme spicate, peduncled. Bracts spatulate, densely glandular hairy. Corolla white with 2 yellow dots on lower lip.

Western Peninsular India. Fairly common in Ghats. December-February. *HFP* 1147, 1166.

Note: Bremekamp (*Mat. Mono. Strob.* 272. 1944) was doubtful of the status of *Strobilanthes caudatus*. After studying our materials, Dr. Thanikaimoni of Institut Francais, Pondicherry, feels that the pollen grains are similar to those of the *Mackenziea* group.

MEYENIA Nees

Undershrubs, trailing or climbing. Leaves sessile, palmately veined. Flowers solitary, axillary; bracts 0; bracteoles large, enclosing flower buds. Calyx 5-lobed. Corolla gradually widening into 5 lobes. Stamens 4, didynamous; anther cells equal or subequal, usually spurred below, longitudinally hairy on the back. Ovary glabrous; locules 2-ovuled. Capsule glabrous, globose below, beaked; seeds globose.

Meyenia hawtayneana (Wall.) Nees in Wall., Pl. As. Rar. 3: 78. 1832; Wight, Ic. t. 1487. 1849; Gamble, Fl. Madras 1009(708). 1924. *Thunbergia hawtayneana* Wall., Tent. Fl. Nap. 49. 1826.

Trailing undershrubs. Leaves 2-4.5×2-4 cm, ovate, cordate, coriaceous. Bracteoles broadly ovate, to 2.5×1.5 cm, glabrous. Corolla to 5 cm long; lobes spreading, rounded, blue or purple. Anthers spurred below. Capsule to 2.5 cm long.

Western Peninsular India. Common in gravelly soil in the plains. April-September. *CJS* 16889, *HFP* 1805.

NILGIRIANTHUS Bremekamp

Shrubs gregariously flowering (pliestesial or gregariously monocarpic). Inflorescence of spikes, often short and capitate, generally bracteolate. Calyx lobes 5, rarely unequal, usually 3-nerved. Corolla campanulate, 5-lobed. Stamens 2 or 4 (didynamous); filaments usually hairy; staminodes rarely present; pollen grains ellipsoid, with punctate lines. Ovary usually hairy; locules 2-ovuled. Seeds sometimes with mucilaginous hairs.

1 Stem winged.....*N. barbatus*
1 Stem not winged.
 2 Bracts glabrous.
  3 Stamens long-exserted; bracts green.....*N. ciliatus*
  3 Stamens included; bracts pink.....*N. heyneanus*

2 Bracts hairy or strigose.
4 Spike elongate; bracts hairy.....*N. warrensis*
4 Spike capitate; bracts strigose.....*N. neilgherrensis*

Nilgirianthus barbatus (Nees) Bremek., Mat. Mon. Strob. 172. 1944; Sant., Bot. Mem. Univ. Bombay No. 2, 39. 1951. *Strobilanthes barbatus* Nees in Wall., Pl. As. Rar. 3: 85. 1832; Bedd., Fl. Sylv. t. 212. 1872; Gamble, Fl. Madras 1037(727). 1924.

Stem 4-winged. Leaves with a decurrent petiole, 9-18×4-8 cm, obovate-lanceolate. Spike dense, capitate. Bracts ovate-acuminate; bracteoles 2, linear. Calyx lobes acuminate. Corolla lobes ovate, sparsely ciliate. Staminal filaments densely bearded below.

South W. India. Common along banks of streams and rivers in wet deciduous forests in upper Ghats. It is said to flower every 7 years. Ours in flower throughout the year 1970. *CJS* 16215, *HFP* 92, 999.

Nilgirianthus ciliatus (Nees) Bremek., Mat. Mon. Strob. 172. 1944; Sant., Bot. Mem. Univ. Bombay No. 2, 40. 1951. *Strobilanthes ciliatus* Nees in Wall., Pl. As. Rar. 3: 85. 1832; Bedd., Ic. t. 211. 1874; Gamble, Fl. Madras 1039(729). 1924.

Leaf blade 9-14×4-5 cm, ovate, crenate. Spike capitate, ellipsoid, peduncled, deflexed at maturity; bracts orbicular, glabrous; bracteoles linear. Calyx lobes linear-spatulate. Corolla white-purplish; tube cylindrical; lobes ovate. Stamens 4, exserted; filaments white-fringed, hairy at base.

South W. India. Common in partial shade, along edges of wet-deciduous forests in upper Ghats. This apparently flowers every year as supposed by Beddome. It has been collected by us in 1968, 1969, 1970, 1971, with flowering from October-December. *CJS* 15303, *HFP* 836, 2307.

Nilgirianthus heyneanus (Nees) Bremek., Mat. Mon. Strob. 173. 1944. *Strobilanthes heyneanus* Nees in Wall., Pl. As. Rar. 3: 85. 1832; Gamble, Fl. Madras 1041(730). 1924. *Strobilanthes rugosus* Wight, Ic. t. 1619. 1850.

Leaves 7-17×4-7 cm, ovate, unequal below. Spike capitate, subglobose; bracts pink, orbicular-rounded, concave, glabrous; bracteoles 0. Calyx lobes linear-oblong, slightly emarginate. Corolla purple, lobes acute. Stamens 4, included; filaments pilose below.

South W. India. Common around thickets and edges of wet deciduous to semi-evergreen forests in Ghats, sometimes along brooks and streams. Massive flowerings have been in seasons of 1965-66 and 1969-70 (every four years). *CJS* 16595, *HFP* 400.

Nilgirianthus neilgherrensis (Bedd.) Bremek., Mat. Mon. Strob.

173. 1944. *Strobilanthes neilgherrensis* Bedd., Ic. t. 196. 1874; Gamble, Fl. Madras 1039(728). 1924.

Strigose shrubs. Leaves 9-14×7 cm, ovate; petioles to 6 cm. Spike capitate; bracts ovate-lanceolate; bracteoles linear. Calyx lobes linear. Corolla white; tube short, cylindric. Stamens 4; filaments pilose.

South W. India. Common along edges of wet deciduous forests, near streams at Bannuhalla toward Bisle Ghat and along banks of Jayaparvathi river at Devarunde. It was found in flower in 1910. It was collected by us in flower in September 1970. *HFP* 651, 1058.

Nilgirianthus warrensis (Dalzell) Bremek., Mat. Mon. Strob. 173. 1944; Sant., Bot. Mem. Univ. Bombay No. 2, 41. 1951. *Strobilanthes warrensis* Dalzell, Hooker's J. Bot. Kew Gard. Misc. 2: 341. 1850; Gamble, Fl. Madras 1039(728). 1924. *Strobilanthes parviflorus* Bedd., Ic. t. 197. 1874.

Leaves 3-6×2.5-4 cm, ovate, crenate, with bulbous-based hairs; petioles 2.5 cm long. Spike elongate, to 3 cm long; bracts obovate, acuminate, hairy; bracteoles linear. Calyx lobes nearly free, to 1 cm, oblong-spatulate, ciliate. Corolla white; tube cylindric below; lobes ovate. Stamens 4; filaments hairy.

South W. India. Locally common on exposed peak at Genkalbetta in upper Ghats. Flowering in October 1969. *CJS* 15258.

PERISTROPHE Nees

Herbs; stem usually angled. Inflorescence usually of panicles of cymes; flowers shorter than bracts. Calyx lobes 5, linear, acute. Corolla hairy; tube thin; limb bilabiate. Stamens 2, exserted; staminodes 0; filaments hairy below; anther cells 2, placed at unequal levels, not spurred. Locules 2-ovuled. Capsule stipitate; seeds papillose, glochidiate.

Peristrophe bicalyculata (Retz.) Nees in Wall., Pl. As. Rar. 3: 113. 1832; Gamble, Fl. Madras 1084(759). 1924. *Dianthera bicalyculata* Retz., Act. Holm. 297, t. 9. 1775.

Stem sharply 4-6-angled, hairy. Leaves to 3.5×1.5 cm, ovate, hairy. Cymes collected in panicles; bracts linear-spatulate, to 1.5 cm long, glandular-hairy; bracteoles shorter, scarious-margined. Calyx lobes linear, hairy. Corolla pink; tube elongate.

Tropical Africa, Tropical India, Burma. Common in eastern plains, along roadsides and ditches in the open. October-January. *CJS* 15172, *HFP* 1404.

PHAULOPSIS Willdenow *emend.* Sprengel *nom. cons.*

Herbs. Inflorescence of dense capitate spikes; each bract large, enclosing 2-3 flowers; bracteoles 0. Calyx 5-partite, unequal with one of them enlarged and bract-like. Corolla small, limb 5-lobed, contorted. Stamens 4, didynamous, included; anther cells 2, parallel, not spurred. Ovary glandular-hairy near tip; locules 2-ovuled. Capsule oblong, acute; seeds compressed, hairy.

Phaulopsis dorsiflora (Retz.) Sant., Kew Bull. 3: 276. 1948; Bot. Mem. Univ. Bombay No. 2, 30. 1951. *Ruellia dorsiflora* Retz., Obs. Bot. 6: 31. 1791. *Micranthus oppositifolius* Wendl., Bot. Beobacht. t. 39. 1798; Gamble, Fl. Madras 1022(718). 1924.

Erect herbs. Leaf blade 2.5-8 × 2.2-3.5 cm, ovate, sparsely hairy. Bract large, orbicular, 0.8 × 1.2 cm, membranous, hairy. Calyx lobes hairy, unequal, 1 ovate, the rest linear. Corolla 0.7 cm long, white; lobes rounded.

Tropical Africa, Madagascar, India. Common in Ghats in deciduous to semi-evergreen forest undergrowth, or along their edges. November-January. *CJS* 12052, 15776.

PHLEBOPHYLLUM Nees

Shrubs or undershrubs. Leaves petiolate, generally crenate-serrate. Inflorescence of spikes; bracts concealing calyx; bracteoles narrower than bracts, both persistent. Calyx lobes 5, subequal, usually acute. Corolla ventricose from near base, usually palate hairy within, 5-lobed. Stamens 2, included, filaments generally hairy; staminodes 0; pollen grains ellipsoid, virgate, usually with punctate bands. Ovary usually glabrous; locules 2-ovuled.

Phlebophyllum canaricum (Bedd.) Bremek., Mat. Mon. Strob. 169. 1944. *Strobilanthes canaricus* Bedd., Ic. t. 215. 1874; Gamble, Fl. Madras 1037(726). 1924.

Shrubs, hirsute. Leaf blade 3-4.5 × 2-2.5 cm, ovate. Spike elongate, to 2-4 cm long. Calyx lobes ovate, acuminate, pubescent. Corolla tubular, campanulate above, hairy, purple; lobes rounded.

Kudremukh in western Karnataka and now Hassan. Locally common on steep rock surfaces at Genkalbetta, in upper Ghats. There is no record of its flowering frequency. The species was in flower in December 1970. *HFP* 1169.

PSEUDERANTHEMUM Radlkofer

Fruticose herbs. Inflorescence usually of racemes or spikes; bracts

and bracteoles small. Calyx 5-partite, exceeding bracts. Corolla tube elongate, cylindrical, not widening at tip, 5-lobed. Stamens 2, slightly exserted; anther cells 2, usually parallel; staminodes often present. Locules 2-ovuled. Capsule clavate; seeds compressed, rugose.

Pseuderanthemum malabaricum (C. B. Clarke) Gamble, Fl. Madras 1064(745). 1924. *Eranthemum malabaricum* C. B. Clarke in Hooker, Fl. Brit. India 4: 497. 1884.

Petiole usually drying black; blade 7-16×3.2-8 cm, broadly elliptic. Inflorescence of terminal, interrupted spikes; axis drying black; bracts ovate, ciliate; bracteoles smaller. Calyx lobes longer than bracts, lanceolate, acuminate, hairy. Corolla sparsely hairy without, white; tube 2.6 cm long; lobes oblong, acute. Anther cells 2, placed at unequal levels.

Western Peninsular India. Locally common along the banks of Kempuhole, in shade of semi-evergreen forest trees in lower Shiradi Ghat. December-March. *CJS* 16211, 16376.

RHINACANTHUS Nees

Suffruticose. Inflorescence axillary, of peduncled cymes; bracts and bracteoles small. Calyx deeply 5-partite, lobes linear. Corolla tube long; limb bilabiate; upper lip considerably shorter than the lower. Stamens 2, inserted at throat of corolla tube; staminodes 0; anther cells 2, placed at the same level, not spurred. Locules 2-ovuled. Capsule stalked, seeds pubescent.

Rhinacanthus nasutus (L.) Kurz, J. As. Soc. Bengal 39(2): 79. 1870. Backer & Bakh. f., Fl. Java 2: 585. 1965. *Justicia nasuta* L., Sp. Pl. 16. 1753. *Rhinacanthus communis* Nees in Wall., Pl. As. Rar. 3: 109. 1832; Wight, Ic. t. 464. 1841; Gamble, Fl. Madras 1083 (758). 1924.

Leaf blade 5-7.5×2.5-4 cm, elliptic. Cymes branching, appressed-pubescent. Calyx lobes ovate-lanceolate, viscid. Corolla white, tube to 2 cm long.

Madagascar, India, Sri Lanka, Java. Occasional in partial shade along hedges near coconut groves. April. *CJS* 16735.

RUNGIA Nees

Herbs. Inflorescence of secund spikes; bracts usually in 2-4 rows, 2 of the rows barren, sometimes differing from fertile ones; bracteoles considerably narrowed. Calyx 5-fid; lobes narrow. Corolla 2-lipped. Stamens 2; anther cells 2, placed at different levels, lower spurred. Locules 2-ovuled. Capsule oblong; seeds compressed.

1 Sterile and fertile bracts dissimilar.....*R. pectinata*
1 Sterile and fertile bracts similar.
2 Bracts scarious margined.....*R. repens*
2 Bracts not scarious-margined.....*R. linifolia*

Rungia linifolia Nees in Wall., Pl. As. Rar. 3: 110. 1832; Gamble, Fl. Madras 1070(749). 1924. *Rostellularia gracilis* Wight, Ic. t. 1541. 1850.

Leaves subsessile, 4-6×1-1.5 cm, elliptic-lanceolate. Bracts ovate, acuminate, scarious-margined, glandular-pubescent; bracteoles linear. Calyx lobes linear-lanceolate, ciliate. Corolla white-pinkish.

South W. India. Common at outskirts of wet deciduous forests and in cardamom estates at Devalkere and Devarunde. January-February. *CJS* 16461, *HFP* 1369.

Rungia pectinata (L.) Nees in DC., Prodr. 11: 469. 1847; Wight, Ic. t. 1547. 1850; Sant., Bot. Mem. Univ. Bombay No. 2, 77. 1951. *Justicia pectinata* L. in Torner, Cent. II. Pl. 3. 1756. *Rungia parviflora* var. *pectinata* (L.) C. B. Clarke in J. Hooker, Fl. Brit. India 4: 550. 1885; Gamble, Fl. Madras 1071 (750). 1924.

Leaves subsessile, 2-5×0.5-1 cm, ovate-elliptic. Spikes short, mostly axillary. Fertile bracts ovate, very much hyaline-margined, hairy on back and margins; barren ones reduced in size, not hyaline-margined. Calyx lobes linear-lanceolate, acuminate. Corolla purple, hairy.

India, Sri Lanka, Burma. Usually as weed in plains and also along edges of semi-evergreen forests in Ghats. December-February. *CJS* 15897, *HFP* 2627.

Rungia repens (L.) Nees in Wall., Pl. As. Rar. 3: 110. 1832; Gamble, Fl. Madras 1070(750). 1924. *Justicia repens* L., Sp. Pl. 15. 1753.

Leaves subsessile, to 4×1 cm, ovate-elliptic. Spike usually terminal. Bracts orbicular, apiculate, to 0.6×0.5 cm; margin hyaline. Calyx lobes 5, linear. Corolla pink.

India, Sri Lanka. Common amongst grasses in open country, bunds of paddy fields, sometimes along roadsides. All seasons. *CJS* 11952, *HFP* 1823.

STAUROGYNE Wallich

Herbs. Inflorescence usually of terminal spikes; bracts large, foliaceous; bracteoles smaller. Calyx deeply 5-partite. Corolla bilabiate. Stamens 4, didynamous, included, occasionally with a staminode; anther cells 2, distant, short, globose. Locules many-ovuled. Seeds pitted-smooth, globose.

Staurogyne zeylanica (Nees) Kuntze, Rev. Gen. Pl. 497. 1891; Gamble, Fl. Madras 1011(710). 1924. *Emermaiera zeylanica* Nees in DC., Prodr. 11: 74. 1847.

Leaf blades 3-6 × 1-2.4 cm, oblong, elliptic, decurrent at base, hairy. Spike terminal; bracts to 1 × 0.2 cm, foliaceous, spatulate, ciliate, hairy. Corolla white-pinkish, glabrous, to 0.8 cm long. Capsule fusiform; seeds pitted.

Western Peninsular India. Fairly common in shade in wet deciduous to semi-evergreen forests in Ghats. December-March. *CJS* 15841, 15896.

THUNBERGIA Retzius *nom. cons.*

Herbaceous undershrubs, usually climbing. Leaves palmately veined. Inflorescence axillary, of solitary flowers or racemes; bracts small, at base of pedicel; bracteoles large, spathaceous, enclosing flower buds. Calyx usually 10-18-fid, sometimes truncate. Corolla large, usually showy, 5-lobed. Stamens 4, didynamous, included; anther cells 2, parallel or slightly unequally placed, usually spurred below. Locules 2-ovuled, collateral. Capsule globose below, beaked; seeds globose, hollowed or flattened at base.

1 Petiole winged ..... *T. alata*
1 Petiole not winged ..... *T. fragrans*

Thunbergia alata Bojer ex Sims, Bot. Mag. t. 2591. 1825; Gamble, Fl. Madras 1008(708). 1924.

Petiole winged; blade 3.5-5.5 × 3-4.2 cm, ovate, sagittate. Flower solitary, long-pedicellate; bracteoles 1.8 × 1 cm, broadly ovate. Calyx 10-fid; lobes linear. Corolla bright yellow with a dark center. Anther cells 2, slightly unequally placed, spurred below, glandular-hairy. Capsule pubescent; beak splitting into 2.

Native of Africa, cultivated in India. Naturalizing in Hassan along Biccode-Arehally road and Haliyar road. September-December. *CJS* 15047, 15561.

Thunbergia fragrans Roxb., Pl. Cor. t. 67. 1796.

var. **laevis** (Nees) C. B. Clarke in J. Hooker, Fl. Brit. India 4: 391. 1884; Gamble, Fl. Madras 1007(707). 1924. *Thunbergia laevis* Nees in Wall., Pl. As. Rar. 3: 77. 1832.

Leaf blade 3-6 × 2-4 cm, ovate, cordate. Flower solitary, long-pedicellate; bracteoles to 2 × 1.2 cm, ovate, hairy. Calyx 14-fid, lobes subulate, densely pubescent. Corolla white. Anthers shortly spurred below, bearded.

Central & Peninsular India. Common in plains and edges of wet deciduous forests in upper Ghats. July-October. *CJS* 10848, 14659.

Thunbergia mysorensis (Wt.) T. Anders. has been collected in the undergrowth of semi-evergreen forests on Charmadi Ghat (Chickmagalur Dist.). It may occur in Hassan District also. (Plate 9).

XENACANTHUS Bremekamp

Undershrubs. Inflorescence of capitate spikes; bracts usually broad, 3-nerved, longer than calyx, the lowest leaf-like; bracteoles linear. Calyx lobes 5. Corolla 5-lobed. Stamens 4, included; filaments hairy at base; staminodes 0; pollen grains ellipsoid, rodlike, carunculate or echinulate. Ovary hairy; locules 2-ovuled.

Xenacanthus pulneyensis (C. B. Clarke) Bremek., Mat. Mon. Strob. 176. 1944. *Strobilanthes pulneyensis* C. B. Clarke in J. Hooker, Fl. Brit. India 4: 438. 1884; Gamble, Fl. Madras 1038(727). 1924.

Leaf blade 6-9 × 3.5-6 cm, ovate, hairy. Spike peduncled. Calyx lobes linear, hairy. Corolla purple, lobes ovate. Stamens 4, included.

South W. India. Fairly common along streams and brooks, along edges of wet deciduous forests in upper Ghats. Gamble records that it flowered in 1885. The species has been collected in flower in winter of 1969-70. *CJS* 15692, *HFP* 909.

123. PEDALIACEAE

K. N. Gandhi

MARTYNIA Linnaeus

Erect, viscid-pubescent herbs. Leaves usually opposite, membranous; venation palmate. Inflorescence a short raceme; bracts deciduous. Flowers bisexual, irregular, distinctly pedicelled, subtended by persistent bracteoles. Calyx 5-partite, segments unequal. Corolla gamopetalous, ventricose. Stamens epipetalous, 2; anthers coherent, cells diverging, medifixed; staminodes 2-3. Disc fleshy. Ovary superior, spuriously 4-locular by the intrusion of 2 opposite, T-shaped parietal placentas; each locule with a solitary pendulous ovule. Style erect; stigma 2-lamellate. Fruit with hooked beak, usually 4-seeded; pericarp fleshy and deciduous; endocarp persistent, 8-ribbed.

Martynia annua L., Sp. Pl. 618. 1753; Gamble, Fl. Madras 1003(705). 1924.

Leaf blade irregularly dentate, broadly ovate, cordate, to 18×18 cm. Raceme 3-10 cm long. Flowers showy. Drupe ovoid, 3 cm long with hooked beak which splits in two; pericarp green, glandular-hairy.

Native of Mexico. Naturalized and locally common herbs at foot of Chicktirupathi near Arsikere. June-August. *CJS* 13975, 15186.

* * *

Sesamum orientale L. is frequently cultivated for oil and weakly persists. It is commonly known as *S. indicum* L. According to Backer and Bakhuisen the first author to unite these equally priorable species was Graham (1839) and he adopted *S. orientale.* Unless there is an earlier synonymy Graham's choice must be followed (Art. 57). Most workers have followed de Candolle's (*Prodromus* 9: 250. 1845) later reduction of *S. orientale* to *S. indicum.*

124. LENTIBULARIACEAE

K. N. Gandhi

UTRICULARIA Linnaeus

The editors are grateful to Mr. P. Taylor (Kew) for kindly reviewing the treatment.

Scapigerous, delicate herbs of wet areas, bearing filiform, simple or branched stolons and capillary rhizoids, leaves and bladder-like insectivorous, minute traps: traps stalked, with a 2-lipped mouth at various positions (basal, lateral or apical), consisting of a trap door entrance which when triggered, opens inward with expansion of bladder sucking the organisms in; lips with various appendages. Stipules 0. Leaves often rosulate; submerged ones highly dissected, aerial entire, often obsolete or disappearing before flowering. Inflorescence racemose, bracteate; bracteoles 0 or 2. Scape simple or branched, erect or twining, usually with short scales. Flowers bisexual, irregular. Calyx deeply divided into 2, usually accrescent lobes. Corolla gamopetalous, usually spurred at back, 2-lipped, basically 5-lobed; upper lip subentire; lower lip larger and often lobed; palate raised, usually gibbous. Stamens 2; anthers 1-2-celled, dorsifixed. Ovary superior, 1-locular, with 2-many ovules on free central placenta; style contiguous with ovary, short, 2-lobed, persistent. Fruit a capsule, surrounded by calyx; seeds 1-many, minute, often reticulate.

1 Free-floating aquatic herbs; bracteoles absent.
2 Peduncle with a whorl of spongy floats; scale absent..... *U. stellaris*
2 Peduncle without floats; scales 1-few.

3 Ultimate leaf segments numerous, setulose; scales 2-3 ..... *U. australis*
3 Ultimate leaf segments few, not setulose; scale 1 ..... *U. exoleta*
1 Affixed terrestrial, aquatic or epiphytic herbs; bracteoles present.
4 Epiphytic herbs. Leaves orbicular-reniform; seeds glochidiate ..... *U. striatula*
4 Marsh or aquatic herbs. Leaves linear-spatulate; seeds not glochidiate.
5 Flowers subsessile; scales and bracts attached at middle ..... *U. caerulea*
5 Flowers pedicelled; scales and bracts attached at base.
6 Flowers yellow.
7 Pedicels recurved in fruit; scapes erect ..... *U. bifida*
7 Pedicels suberect in fruit; scapes usually twining ..... *U. scandens*
6 Flowers light blue to purple.
8 Calyx usually shorter than pedicel; lobes longer than wide (in fruit), not denticulate, acute-acuminate; seeds not produced; plant erect or twining ..... *U. graminifolia*
8 Calyx usually equaling or longer than pedicel; lobes nearly as wide as long (in fruit), minutely denticulate, usually obtuse; seeds usually produced; plant always erect ..... *U. uliginosa*

Utricularia australis R. Br., Prodr. 430. 1810.

Aquatic, free-floating herbs. Leaves cauline, numerous, pinnately divided; primary leaf segments always two, ultimate segments finely setulose. Traps with lateral mouth; upper lip with simple appendages. Scape emergent, slightly stout, to 10 cm long, without floats; scales and bracts basifixed; bracteoles absent. Flowers 4-10; pedicels elongating and curved in fruit. Calyx lobes subequal; upper lobe subacute; lower lobe shortly bifid. Corolla yellow; upper lip longer than upper lobe of calyx; lower lip suborbicular, entire; spur curved under lower lip. Seeds prismatic, angled, narrowly winged.

W. Europe to Japan with southward extensions to S. Africa, Sri Lanka, S. E. Australia. Collected once in flower and fruit from a tank at Arkalgud (dry plain) on September 30, 1967. *CJS* 11079.

Note: Mr. P. Taylor in one of his personal communications writes that this taxon, "was confused with *U. aurea* (under the name *U. flexuosa* Vahl) by Bentham in Fl. Austr. and by C. B. Clarke in F. B. I. The two species are quite distinct and may have very different distributions." *U. aurea* Lour. is distinguished by the absence of scales and presence of 3 or more primary leaf segments and can be expected in the District.

Utricularia bifida L., Sp. Pl. 18. 1753; Gamble, Fl. Madras 982(69). 1924.

Erect herbs. Leaves linear, 1-nerved. Traps with basal mouth; appendages of upper lip simple. Scape filiform, to 10 cm; scale, bracts and bracteoles basifixed. Flowers 2-5; pedicel recurved and narrowly winged in fruit. Calyx lobes brown, subequal, rounded-obtuse at apex. Corolla yellow; upper lip longer than upper lobe of calyx, oblong, obtuse; lower lip 3.5 mm long; palate very distinct; spur slightly curved. Capsule depressed globose; seeds obovoid, reticulate.

Indomalaysia. Collected once in flower and fruit from a marshy place at Tagare (dry plain) on October 23, 1971. *HFP* 2289.

Utricularia caerulea L., Sp. Pl. 18. 1753; Wight, Ic. t. 1583. 1850; Gamble, Fl. Madras 983(691). 1924. *Utricularia racemosa* Wall. ex A. DC., Prodr. 8: 21. 1844.

Erect herbs. Leaves spatulate. Scape to 30 cm, slender; scales, bracts and bracteoles attached at middle. Flowers 3-7, subsessile. Calyx lobes subequal, obtuse-subacute. Corolla purple; upper lip oblong or obovate, entire-notched at apex, equaling upper lobe of calyx; lower lip 5 mm long, crenulate along the margin; spur curved upward, 6-9 mm long. Capsule globose, papillose; seeds reticulate.

Indomalaysia. Collected once in flower and fruit along a stream at base of Nagpuri (scrub) on October 8, 1969. *CJS* 15214.

Utricularia exoleta R. Br., Prodr. 430. 1810; Gamble, Fl. Madras 980(689). 1924. *Utricularia gibba* L. ssp. *exoleta* (R. Br.) P. Taylor, Mitt. Bot. Staatssamml. Munchen 4: 101. 1961; Kew Bull. 18: 204. 1964.

Aquatic, free-floating herbs, sometimes with the rhizoids affixed to to the mud. Leaves numerous, alternate on stolons, capillary, forked. Traps with lateral mouth; upper lip with 2, branched appendages. Scape emergent, slender, to 10 cm; scale and bracts basifixed; bracteoles absent. Flowers 2-3, pedicelled. Calyx lobes subequal, obtuse at apex. Corolla yellow, often with pink striations; upper lip broadly ovate, entire or obscurely lobed, longer than upper lobe of calyx; lower lip 4-5 mm long; palate prominently raised; spur straight, 4-6 mm long. Capsule globose; seeds winged.

Paleotropics. Occasional herbs in waterlogged marshes and tanks in western plain and upper Ghats. All seasons. *CJS* 11568, *HFP* 1380.

Note: Mr. P. Taylor in his personal communication informs us that he now intends to reinstate *U. gibba* ssp. *exoleta* as a distinct species.

Utricularia graminifolia Vahl, Enum. 1: 195. 1804; Gamble, Fl. Madras 981(690). 1924. *Utricularia pedicellata* Wight, Ic. t. 1578, f. 2. 1850. *Utricularia uliginoides* Wight, Ic. t. 1573. 1850. *Utricularia conferta* Wight, Ic. t. 1575. 1850. *Utricularia caerulea* auct. non L.: Clarke, in J. Hooker, Fl. Brit. India 4: 331. 1884.

Leaves linear, 3-nerved. Traps with basal mouth; upper lip with simple appendages. Scapes erect or twining, to 40 cm; scales, bracts and bracteoles basifixed. Pedicels usually longer than calyx. Calyx lobes subequal, longer than wide (in fruit), acute or acuminate. Corolla blue; upper lip obovate, larger than upper calyx lobe; lower lip ovate-orbicular, 7 mm long, truncate; palate slightly raised; spur narrowly conic, curved. Capsule depressed globose; seeds ovoid, with elongated testa cells.

South India eastwards into Trop. China. Frequent in marshy places of upper Ghats. All seasons. *CJS* 15681, *HFP* 2496.

Note: Some of our specimens were thought to be *U. smithiana* Wight. However Mr. P. Taylor considers them as the largest forms of *U. graminifolia.*

Utricularia scandens Benj., Linnaea 20: 309. 1847.

ssp. **scandens;** P. Taylor in Hutch. & Dalz., Fl. W. Trop. Afr. ed. 2, 2: 378. 1963; Kew Bull. 18: 46, 1964. *Utricularia wallichiana* Wight, Ic. t. 1572, f. l. 1850; Gamble, Fl. Madras 982(690). 1924.

Leaves linear, 1-nerved. Traps with basal mouth; upper lip with 2, simple appendages; lower lip with an appendage. Scape to 10 cm, usually twining on other herbs; scales, bracts and bracteoles basifixed. Flowers 3-5; pedicels 3 mm long, suberect in fruit. Calyx lobes subequal; upper lobe subacuminate; lower lobe bifid-trifid. Corolla yellow; upper lip emarginate, shorter than upper calyx lobe; lower lip orbicular, 5-7 mm long; palate prominently raised; spur almost straight. Capsule compressed; seeds ellipsoid, with prominent hilum and elongated reticulation.

Trop. Africa through Malaysia. Occasional in marshy places of plain. All seasons. *CJS* 15457, *HFP* 2497.

Utricularia stellaris L. f., Suppl. 86. 1781; Wight, Ic. t. 1567. 1850; Gamble, Fl. Madras 980(689). 1924. *Utricularia inflexa* Forsk. var. *stellaris* (L. f.) P. Taylor, Mitt. Bot. Staatssamml. Munchen 4: 96. 1961; Kew Bull. 18: 189. 1964.

Aquatic, free-floating herbs. Leaves numerous, whorled, auricled at base, repeatedly divided and ultimate segments setulose; auricles with ciliated segments. Traps numerous, with lateral mouth; upper lip with 2, branched appendages. Scape to 12 cm long, emergent with a whorl of floats above the middle; floats 5-7, ellipsoid, with short pinnae at apex; bracts basifixed; scales and bracteoles absent. Flowers 5-7, pedicelled. Calyx lobes subequal; upper lobe rounded; lower lobe truncate or emarginate. Corolla yellow; upper lip broadly ovate, truncate-emarginate, larger than upper calyx lobe; lower lip oblong, truncate, crenate, to 1.8 cm long; palate prominently raised; spur appressed to the lower lip, blunt. Capsule globose; seeds prismatic, 4-6-angled, narrowly winged.

Paleotropics. Frequent in tanks across the plain. All seasons. *CJS* 13562, *HFP* 758.

Note: We have followed the latest recommendation of Mr. P. Taylor in retaining *U. stellaris* L. f. as a distinct species.

Utricularia striatula J. E. Sm. in Rees, Cyclop. 37, No. 17. 1817; Gamble, Fl. Madras 973(691). 1924; P. Taylor, Kew Bull. 18: 91. 1964. *Utricularia glochidiata* Wight, Ic. t. 1518. 1850.

Erect epiphytes. Leaves orbicular-reniform, long-petioled, many-

nerved, persistent. Traps numerous on stolon, with lateral mouth; upper lip with 2 appendages covered with multicellular glandular hairs. Scape to 8 cm, filiform, erect; scales few or absent; bracts medifixed. Flowers few-many, distinctly pedicelled. Calyx lobes very unequal, obtuse or emarginate at apex; lower lobe much smaller. Corolla pale blue, often with white and orange spots; upper lip shorter than upper lobe of calyx, emarginate; lower lip suborbicular, 1 cm across, 5-lobed along the margin; palate obscure; spur curved under the lower lip of corolla. Capsule nearly globose; seeds ovoid, glochidiate.

Paleotropics. Frequent herbs on wet rocks and tree trunks in Ghats. June-October. *HFP* 433, 2052.

Utricularia uliginosa Vahl, Enum. 1: 203. 1804; Gamble, Fl. Madras 981(689). 1924. *Utricularia affinis* Wight, Hooker's J. Bot. Kew Gard. Misc. 1: 373. 1849; Ic. t. 1580, f. 1. 1850; Backer & Bakh. f., Fl. Java 2: 518. 1965.

Erect herbs. Leaves spatulate, 1-3-nerved. Traps with basal mouth; upper lip with simple appendages. Scapes to 8 cm, simple or branched; scales, bracts and bracteoles basifixed. Flowers 3-6; pedicels erect in fruit, usually not longer than calyx. Calyx lobes subequal, minutely denticulate; upper lobe acute; lower lobe shortly bifid. Corolla pale blue; upper lip oblong, emarginate, slightly exceeding upper lobe of calyx; lower lip obovate, 2-3-crenulate at apex, 6 mm long; palate not conspicuous; spur slightly deflexed. Capsule depressed globose; seeds usually produced, sub-globose; cells of testa subhexagonal.

Indomalaysia. Frequent in marshy places of upper Bisle Ghat. July-September. *CJS* 14549, 15298.

125. CAMPANULACEAE

T. P. Ramamoorthy

Usually herbs, sometimes laticiferous. Leaves usually alternate, estipulate, simple, sometimes crenate, serrate, rarely pinnatifid. Inflorescence of axillary, or terminal racemes, sometimes these collected into panicles, bracteate; occasionally flowers solitary. Flowers bisexual, regular or irregular, pedicelled; bracteoles present or absent. Calyx 5-partite, valvate, persistent; corolla 5-lobed, if 2-lipped then with the upper lip 2-lobed and lower 3-lobed. Disc epigynous. Stamens 5; filaments usually free, sometimes widening below; anthers all connate or free, 2-celled, dehiscing laterally. Ovary inferior, rarely superior, 2-3- ocular, sometimes 5-locular; ovules many, axile; style simple; stigma 2-3-lobed, usually papillose. Fruit 2-3-5-valved, apically dehiscing capsule, sometimes a circumscissile capsule or an indehiscent berry. Seeds many.

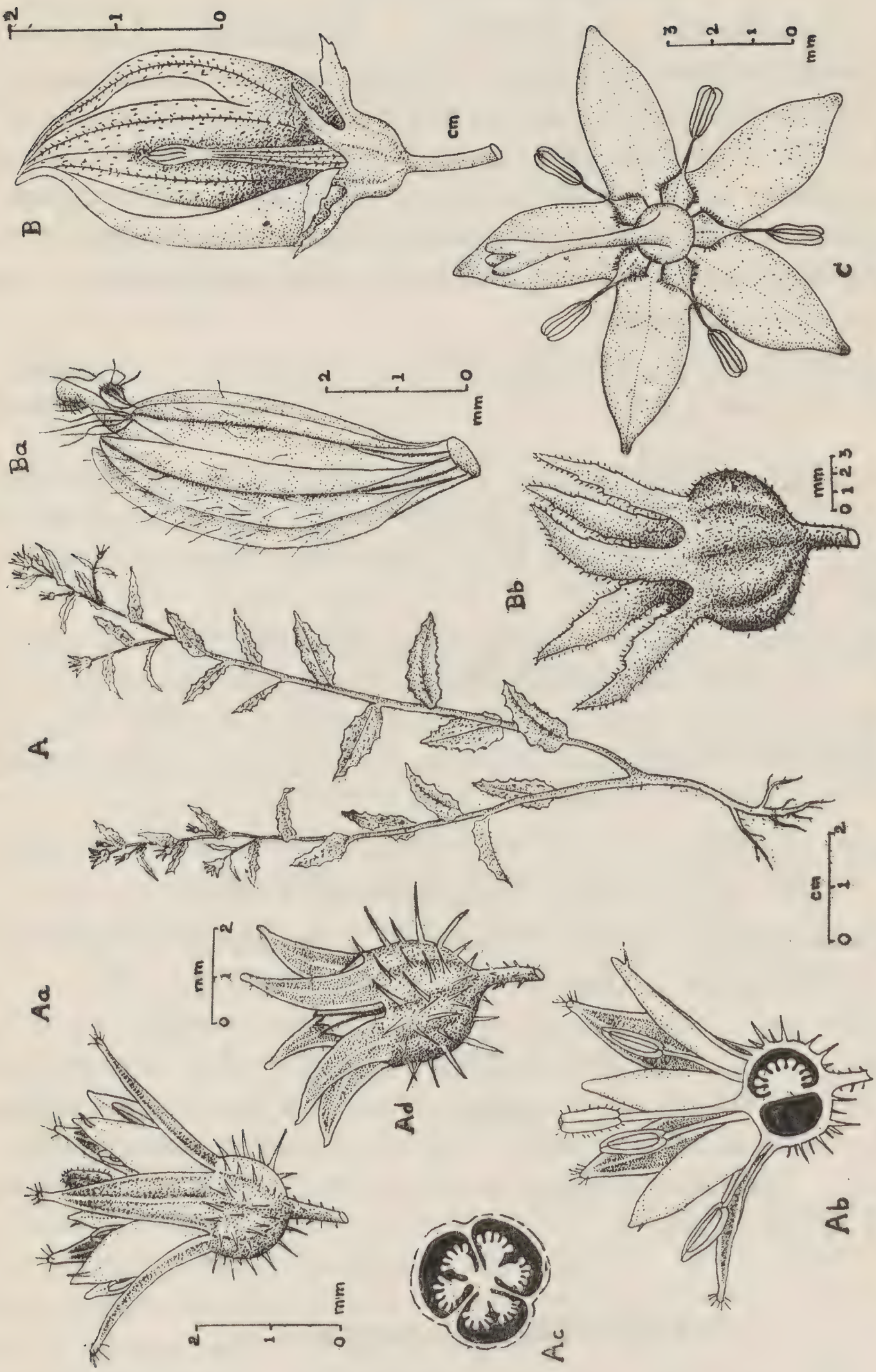


Fig. 101 CAMPANULACEAE. *A. Wahlenbergia erecta*: habit; *Aa*, flower; *Ab*, same, vertical section; *Ac*, ovary, cross section; *Ad*, fruit. *B. Lobelia nicotianifolia*: flower; *Ba*, connate anthers; *Bb*, fruit. *C. Wahlenbergia marginata*: flower, top view.

1 Flower irregular; stamens united by anthers.....**Lobelia**
1 Flower regular; stamens free.....**Wahlenbergia**

LOBELIA Linnaeus

Sometimes undershrubs, often laticiferous. Inflorescence of racemes or of solitary flowers, axillary or terminal. Flowers irregular, usually bracteolate. Calyx-lobes well developed; corolla 2-lipped, the lower lip of 3 connate lobes, the upper one of 2 separating lobes. Staminal filaments partly or completely fused, adnate or not to corolla tube; anthers connate, all or 2 anterior tufted. Ovary 2-locular; ovules numerous, axile; style simple or curving; stigma bilobed and hairy. Capsule 2-valved, sometimes baccate and indehiscent.

1 Slender herbs with sharply trigonous stem.....*L. alsinoides*
1 Undershrubs; stem usually terete.....*L. nicotianifolia*

Lobelia alsinoides Lam., Encycl. 3: 588. 1792; Moeliono and Tuyn in Steenis, Fl. Malesiana ser. 1. 6: 127. 1960. *Lobelia trigona* Roxb., Fl. Ind. 2: 111. 1824; Wight, Ic. t. 1170. 1848; Gamble, Fl. Madras 736(518). 1921.

Erect or ascending herbs with sharply trigonous stem. Leaves crenate, 2-2.5 × 0.5-1 cm, ovate, oblong, rounded or elliptic, palmately 3-veined. Flower solitary, axillary, blue; pedicel 1-1.8 cm; bracts small. Anthers hairy at apex. Free basal part of 2 anterior filaments twice as broad as others.

Indomalaysia. Common slender herbs in moist areas in western plains and upper Ghats. All seasons. *CJS* 15617, *HFP* 55.

Lobelia nicotianifolia Roth ex Roemer & Schultes, Syst. Veg. 5: 47. 1819 ('*nicotianaefolia*'); Gamble, Fl. Madras 736(518). 1921.

Undershrubs to 1.5 m. Leaves spiralled, crenate-serrate, to 30 × 6 cm, lanceolate, ovate, acuminate, rounded and narrowed at base, glabrous with age. Corolla to 2 cm, white; staminal filaments fused, hairy; anthers sparsely hairy on back, hairy at apex. Capsule dehiscent, many-seeded.

Indomalaysia. Common in Ghats, in open disturbed places. October-April. *CJS* 12053, 15576.

WAHLENBERGIA Schrader

Leaves sessile, with obscure veins. Inflorescence terminal, axillary, few-flowered, sometimes flower solitary. Flowers regular, pedicelled. Petals partly fused. Stamens free; filaments sometimes very much broadened at base. Ovary 3-locular; style simple; stigma 3-lobed. Capsule 3-valved, with many seeds.

1 Calyx tube bristly; petals free.....*W. erecta*
1 Calyx tube glabrous; petals fused for half their length.....*W. marginata*

Wahlenbergia erecta (Roemer et Schultes) Tuyn in Steenis, Fl. Malesiana ser. 1, 6: 113. 1960. *Dentella erecta* Roth ex Roemer & Schultes, Syst. Veg. 5: 25. 1819; Roth, Nov. Pl. Sp. 140. 1821. *Cephalostigma schimperi* Hochst. ex Rich., Tent. Fl. Abyss. 2: 2.1851; Gamble, Fl. Madras 738(519). 1921. *Wahlenbergia perotifolia* Wight & Arn., [Prod. 405. 1834, *nom. invalid.*] ex DC., Prod. 7: 434. 1839; Wight, Ic. t. 842. 1844-5, *nom. superfl.*

Erect annuals. Leaves 2.5×0.6 cm, linear-oblong, acute, rounded at base. Flower mostly solitary, axillary. Petals free. Staminal filaments not widened below.

Indomalaysia. Common in shade, on moist soil in deciduous forests. July-November. *CJS* 15879, *HFP* 1013.

Wahlenbergia marginata (Thunb.) DC., Monogr. Camp. 143. 1830; Tuyn in Steenis, Fl. Malesiana ser. 1, 6: 115. 1960. *Campanula marginata* Thunb., Fl. Jap. 84. 1784. *Campanula gracilis* Forst. Prodr. 84. 1786. *Wahlenbergia gracilis* (Forst.) [Schrader, Blumenbachia 38. 1827, in obs.] DC., Monogr. Camp. 142. 1830; Gamble, Fl. Madras 738(519). 1921. *Wahlenbergia agrestis* sensu Wight, Ic. t. 1173. 1848, non DC.

Erect herbs to 10-15 cm. Leaves 2.5×0.6 cm, linear-oblong. Flower solitary, purple. Petals fused below. Staminal filaments widened below, hairy. Ovary 3-locular.

Japan, Indomalaysia. Occasional, in partial shade or full sun, in harvested moist paddy fields or in river beds. March-April. *CJS* 16664, *HFP* 2780.

126. RUBIACEAE

K. N. Gandhi

Herbs, shrubs or trees. Leaves opposite or whorled; stipules inter- or intrapetiolar, usually persistent; blade simple, entire; venation pinnate. Inflorescence various; bracts and bracteoles present or absent. Flowers mostly bisexual and regular, generally 4-6-merous. Calyx gamosepalous, truncate to lobed. Corolla gamopetalous, variously shaped; lobes imbricate, valvate or contorted. Stamens as many as corolla segments. Disc usually present. Ovary inferior, 1-many-locular; locule 1-many-ovuled; style entire or bifid. Fruit a capsule, berry, drupe, or of dehiscent or indehiscent cocci, 1-many-seeded.

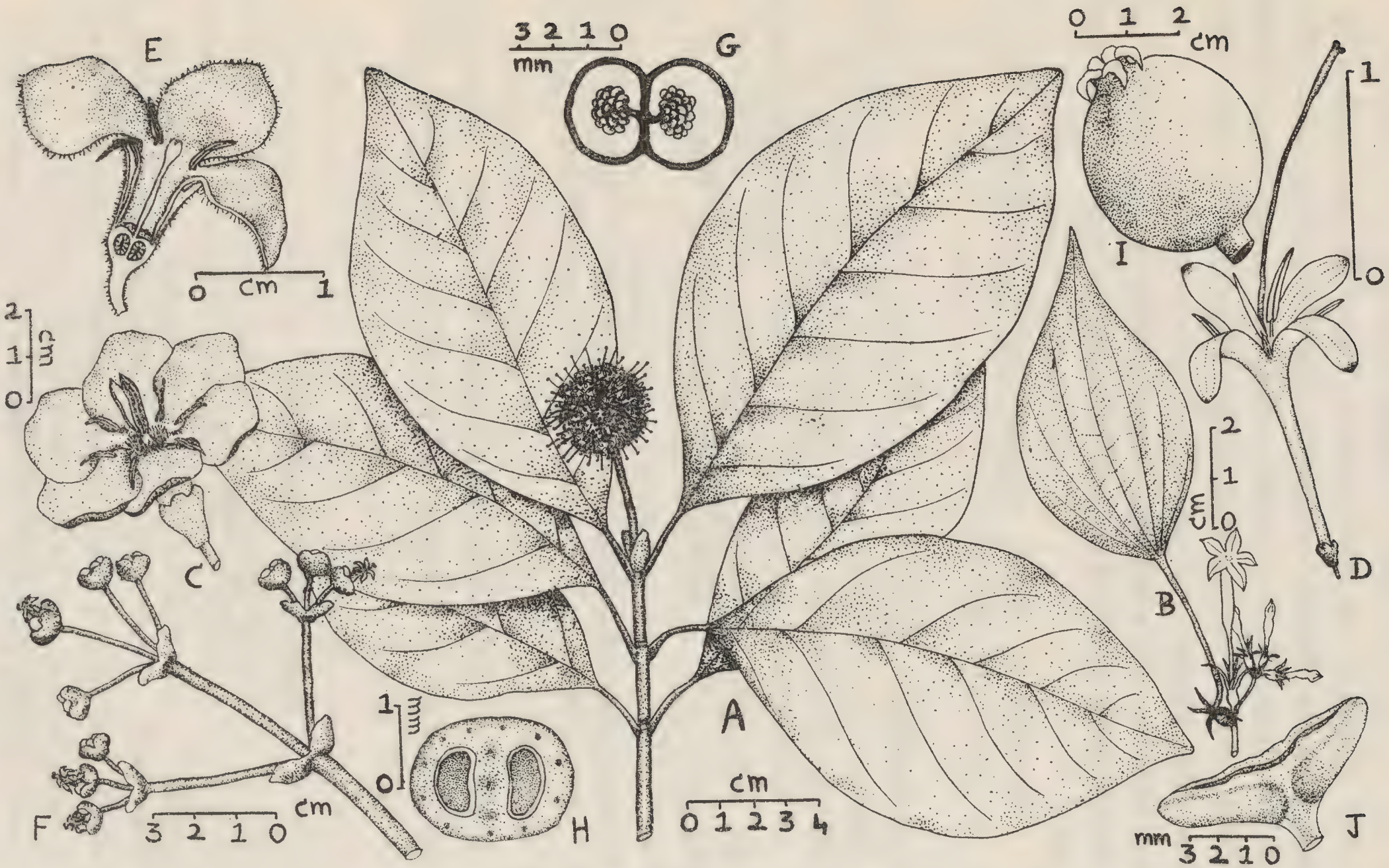


Fig. 102. RUBIACEAE. *A. Neonauclea purpurea*: flowering twig. *B. Mussaenda laxa*: inflorescence with enlarged sepal. *C. Xeromphis spinosa*: flower. *D. Pavetta thomsonii*: flower. *E. Xeromphis spinosa*: flower in section. *F. Psychotria dalzellii*: inflorescence. *G. Oldenlandia*: ovary, cross section. *H. Chasalia ophioxyloides*: section of ovary. *I. Gardenia latifolia*: berry. *J. Ophiorrhiza hirsutula*: fruit.

1 Inflorescence a head and plants trees or shrubs.
2 Shrubs; calyx tubes nearly connate; fruit a syncarpium.....**Morinda**
2 Trees; calyx tubes free; fruit not a syncarpium.
3 Leaves cordate at base.....**Adina**
3 Leaves acute-rounded at base.
4 Flowers bracteolate; corolla lobes valvate.....**Mitragyna**
4 Flowers ebracteolate; corolla lobes imbricate.....**Neonauclea**
1 Inflorescence not capitate or if so then plant a small herb.
5 One of the calyx lobes transformed into a showy bract.....**Mussaenda**
5 All calyx lobes normal.
6 Petioles equaling or longer than leaf blade; climbing scabrid herbs.....**Rubia**
6 Petioles shorter than leaf blade; plants erect or diffuse, if climbing then not scabrid.
7 Stem with spongy swollen cork.....**Mycetia**
7 Stem without spongy cork.
8 Herbaceous or suffrutescent plants.
9 Inflorescence secund; fruit compressed, obcordate.....**Ophiorrhiza**
9 Inflorescence not secund; fruit not compressed or obcordate.
10 Stipules entire.
11 Stipules over 2 cm long, bract-like; leaves over 20 cm long, glaucous beneath .....**Neurocalyx**
11 Stipules less than 2 cm long; leaves less than 15 cm long, not glaucous.
12 Stem woody; inflorescence corymbose; fruit drupaceous.....**Knoxia**
12 Stem slender; inflorescence not a corymb; fruit dry.
13 Corolla lobes dentate; anthers free; fruit indehiscent.....**Dentella**
13 Corolla lobes entire; anthers connivent; fruit dehiscent.....**Argostemma**
10 Stipules lobed or pectinate.
14 Ovules 2-many per locule.
15 Seeds 2-few per locule, not angular.....**Neanotis**
15 Seeds many per locule, angular.....**Oldenlandia**
14 Ovule 1 per locule.
16 Inflorescence corymbose.....**Knoxia**
16 Inflorescence not corymbose.
17 Capsule dehiscence septicidal at apex.....**Borreria**
17 Capsule dehiscence circumscissile.....**Mitracarpus**
8 Shrubs or trees, sometimes climbing.
18 Inflorescence spicate, with a solitary foliaceous bract.....**Hymenodictyon**
18 Inflorescence not spicate; bract otherwise.
19 Ovules 2 or more per locule.
20 Ovary 1-locular; stipules amplexicaul.....**Gardenia**
20 Ovary 2-locular; stipules not amplexicaul.
21 Inflorescence axillary or at apex of brachyblasts.
22 Plants erect, often armed; fruit 2.5-6 cm long.....**Xeromphis**
22 Plants climbing, unarmed; fruit to 1.5 cm long.....**Randia**
21 Inflorescence terminal on normal shoot.
23 Inflorescence not panicled; flowers medium; fruit a drupe.....**Tarenna**
23 Inflorescence panicled; flowers minute; fruit a capsule.....**Wendlandia**
19 Ovule 1 per locule.
24 Ovary 3-9-locular.
25 Plants armed; flowers long-pedicelled.....**Meyna**
25 Plants unarmed; flowers subsessile.....**Lasianthus**
24 Ovary bilocular.
26 Inflorescence axillary; plants often spinous.....**Canthium**

26 Inflorescence terminal or subterminal; plants unarmed.
27 Foetid plants; flowers each clasped by a corky bract.....**Saprosma**
27 Plants not foetid; bracts otherwise.
28 Corolla lobes valvate.
29 Corolla tube erect.....**Psychotria**
29 Corolla tube curved.....**Chasalia**
28 Corolla lobes contorted.
30 Flowers 5-merous; style often hairy.....**Tarenna**
30 Flowers 4-merous; style glabrous.
31 Exserted portion of style shorter than corolla lobes; drupe of two, 1-seeded pyrenes.....**Ixora**
31 Exserted portion of style longer than corolla lobes; drupe of one 2-seeded pyrene.....**Pavetta**

ADINA Salisbury

Stipules interpetiolar, caducous. Inflorescence a globose head; bracteoles paleaceous. Flowers 5-merous. Calyx 5-angled, lobed. Corolla funnel-shaped, valvate. Stamens 5, on short filaments at corolla mouth. Receptacle pilose. Ovary 2-locular, with many pendulous ovules. Fruit a globose head of many capsules separating into 2 cocci; seeds winged.

Adina cordifolia (Roxb.) J. Hooker ex Brandis, For. Fl. t. 33. 1874; Gamble, Fl. Madras 584(412). 1921. *Nauclea cordifolia* Roxb., Pl. Cor. t. 53. 1796; Bedd., Fl. Sylv. t. 33. 1869.

Large trees. Petiole to 8 cm long; leaf blade ovate-orbicular, pubescent, to 18×16 cm. Heads 1-3-fascicled, axillary, 2-3 cm across; peduncle 3-5 cm long, 2-bracteate above the middle. Corolla brownish-yellow. Capsule 4 mm long.

India, Burma, Sri Lanka. Common at lower Shiradi Ghat. May. *CJS* 13678.

ARGOSTEMMA Wallich

Herbs. Leaves in pairs or whorls, subsessile, membranous; stipules small, interpetiolar or 0. Inflorescence usually a terminal cyme or umbel. Flowers 4-6 merous. Calyx campanulate; lobes ovate. Corolla rotate, valvate. Stamens inserted on the base of corolla tube; anthers initially connivent, dehiscing by terminal pores. Ovary 2-locular, with numerous axile ovules; stigma capitate. Fruit a capsule, crowned with persistent calyx limb; seeds angled or compressed.

1 Flowers 4-merous; plants terrestrial.....*A. courtallense*
1 Flowers 5-merous; plants epiphytic.....*A. verticillatum*

Argostemma courtallense Arn., Nat. Hist. 3: 22. 1839; Wight, Ic. t. 1160. 1846; Gamble, Fl. Madras 590(417). 1921.

Sparsely pubescent herbs, with a tuberous root. Leaf pairs often unequal; blade elliptic-ovate, subacute, cuneate, to 7×5 cm. Peduncles 1-3, finally longer than leaves. Flowers 4-merous. Corolla white.

South W. India. Frequent in wet rock-crevices across Ghats. July-August. *HFP* 427, 2040.

Argostemma verticillatum Wall. in Roxb., Fl. Ind. 2: 325. 1824; Gamble, Fl. Madras 590(417). 1921.

Epiphytic herbs. Leaves whorled, ovate-lanceolate, acuminate, to 8×2 cm, pubescent. Umbels 2-3-fascicled or in panicles; peduncles usually shorter than leaves. Flowers 5-merous. Corolla white.

India. Occasional on tree trunks in upper Bisle Ghat. July-August. *HFP* 443, 1991.

BORRERIA G. F. W. Meyer *nom. cons.*

Herbs, sometimes suffrutescent; branches nearly 4-angled. Stipules interpetiolar, connate with the base of leaves into a sheath, pectinate. Inflorescence a head or fascicle; bracteoles many, bristly. Flowers 4-merous, sessile. Calyx 2-4-lobed, often with interposed teeth or bristles. Corolla funnel-shaped, valvate. Stamens 4, inserted on the throat or tube of corolla. Ovary 2-locular; locule with 1 axile ovule; stigma capitate or bifid. Fruit of 2 mericarps, each dehiscing ventrally, with the septum detached from the valves or not; seeds grooved ventrally.

1 Calyx lobes 2; flower fascicles terminal and subterminal.....*B. verticillata*
1 Calyx lobes 4; flower fascicles axillary and terminal.
2 Stem procumbent; corolla tube with a ring of hairs within at base.....*B. articularis*
2 Stem erect; corolla tube without ring of hairs.
3 Corolla lobes hairy within, erect, covering stamens and style; mericarps each covered by septum.....*B. ocymoides*
3 Corolla lobes glabrous; stamens and style exserted; mericarps separating from septum .....*B. pusilla*

Borreria articularis (L. f.) F. N. Williams, Bull. Herb. Boissier ser. 2, 5: 956. 1905; Sant., Fl. Khandala ed. 3, 121. 1967. *Spermacoce hispida* L., Sp. Pl. 102. 1753. *Spermacoce articularis* L. f., Suppl. 119. 1781. *Borreria hispida* (L.) K. Schum. in Engl. & Prantl, Pflanzenfam. 4(4): 144. 1891, non Spruce ex K. Schum., 1888; Gamble, Fl. Madras 654(461). 1921.

Initially erect, then procumbent, hispid herbs. Leaves elliptic-lanceolate, to 3×1 cm. Calyx 4-lobed. Corolla bluish-white. Mericarps pubescent, with septum on one mericarp; septum finally separating.

Indomalaysia. Fairly common across the plain and in upper Ghats. June-December. *CJS* 14613, *HFP* 2064.

Borreria ocymoides (N. Burman) DC., Prodr. 4: 544. 1830; Gamble, Fl. Madras 654(461). 1931. *Spermacoce ocymoides* N. Burman, Fl. Ind. 34, t. 13, f. 1. 1768.

Erect herbs. Leaves elliptic-ovate, subacute, to 3.5×1.5 cm. Calyx lobes 4, unequal. Corolla white. Mericarps each covered by septum.

Tropics. Rare in Ghats. July-October. *CJS* 10247, 14059.

Borreria pusilla (Wall.) DC., Prodr. 4: 543. 1830. *Spermacoce stricta* L. f., Suppl. 120. 1781. *Spermacoce pusilla* Wall. in Roxb., Fl. Ind. 1: 379. 1820. *Spermacoce brachystema* R. Br. ex Bentham, Fl. Austral. 3: 439. 1867. *Borreria stricta* (L. f.) K. Schum. in Engl. & Prantl, Pflanzenfam. 4(4): 143. 1891, non Meyer, 1818; Gamble, Fl. Madras 654(461). 1921. *Borreria brachystema* (Bentham) Valeton in Lorentz, Nova Guinea 8: 516. 1911; Backer & Bakh. f., Fl. Java 2: 354. 1965.

Erect herbs. Leaves ovate-lanceolate, to 4×0.6 cm. Calyx 4-lobed. Corolla white. Mericarps pubescent, separating from septum.

Paleotropics. Scattered across plain. All seasons. *CJS* 11077, 11355.

Borreria verticillata (L.) G. F. W. Meyer, Prim. Fl. Esseq. 83. 1818; Adams, Fl. Pl. Jamaica 732. 1972. *Spermacoce verticillata* L., Sp. Pl. 102. 1753.

Large herbs or subshrubs. Leaves oblong-lanceolate, to 5×1 cm. Heads subterminal. Calyx 2-lobed. Corolla white. Mericarps pubescent, each covered by septum.

Pantropical. Introduced and naturalized; fairly common in open ground across the plain. All seasons. *CJS* 16793, *HFP* 542.

CANTHIUM Lamarck

Note: The type species of *Plectronia* L. is considered to belong to *Oliniaceae* (*Taxon* 8: 68. 1959).

Shrubs or trees, often thorny. Stipules interpetiolar. Inflorescence an umbel, cyme or fascicle. Flowers bisexual or polygamous, 4-5-merous. Calyx obscurely toothed. Corolla funnel-shaped or campanulate, throat with deflexed hairs; lobes as long as tube, valvate. Stamens attached in the throat of corolla; filaments short or 0. Ovary 2-locular, with solitary pendulous ovule per locule. Fruit a drupe of one-two 1-seeded pyrenes.

1 Unarmed trees.....*C. dicoccum*
1 Thorny shrubs.
2 Leaves acuminate; flowers 5-merous.....*C. angustifolium*
2 Leaves obtuse at apex; flowers 4-merous.....*C. parviflorum*

Canthium angustifolium Roxb., Fl. Ind. 2: 169. 1824; J. Hooker,

Fl. Brit. India 3: 135. 1880. *Dondisia leschenaultii* DC., Prodr. 4: 469. 1830. *Canthium leschenaultii* (DC.) Wight & Arn., Prodr. 426. 1834; Wight, Ic. t. 826. 1845. *Plectronia rheedii* (DC.) Bedd. var. *angustifolia* (Roxb.) Gamble, Fl. Madras 625(441). 1921.

Subscandent, armed shrubs. Spines stout, 1.5 cm long, only on old branches. Leaves ovate-lanceolate, long-acuminate, rounded, to 6×3 cm. Flowers in axillary fascicles, 5-merous. Corolla white; lobes reflexed. Drupe globose, 1 cm across.

India, Burma. Occasional across Ghats. November-April. *CJS* 12545, 16373.

Canthium dicoccum (Gaertner) Teys. & Binn., Cat. Hort. Bog. 113. 1866. *Psydrax dicoccos* Gaertner, Fruct. 1: 125, t. 26. 1788.

var. **umbellatum** (Wight) Sant. & Merch., Bull. Bot. Surv. India 3: 107. 1962; Sant., Fl. Khandala ed. 3, 117. 1967. *Canthium umbellatum* Wight, Ic. t. 1034. 1845. *Canthium didymum* auct. non Gaertner: Bedd., Fl. Sylv. t. 221. 1872. *Plectronia didyma* (Gaertner) Kurz var. *umbellata* (Wight) Gamble, Fl. Madras 624(440). 1921.

Unarmed, medium trees. Leaves elliptic-lanceolate, shortly acuminate, acute, to 15×7 cm. Inflorescence an umbel; peduncle 1 cm long. Flowers 5-merous; pedicels elongating with age (to 3 cm long). Corolla white; lobes reflexed. Drupe ovoid, 1.5 cm long.

South India, Burma. Occasional in upper Ghats. December-January. *CJS* 12432, *HFP* 1230.

Canthium parviflorum Lam., Encycl. 1: 602. 1785; J. Hooker, Fl. Brit. India 1: 136. 1880. *Plectronia parviflora* (Lam.) Bedd., For. Man. 124. 1874; Gamble, Fl. Madras 625(441). 1921.

Armed shrubs. Spines very conspicuous, to 5 cm long. Leaves ovate-obovate, to 3.5×1 cm. Inflorescence a few-flowered cyme; peduncle thick, 5 mm long. Flowers 4-merous. Corolla greenish-white. Drupe obcordate, furrowed, 8 mm long.

South W. India. Frequent in scrub. June-August. *CJS* 14679, *HFP* 9.

CHASALIA Commerson ex Poiret

Shrubs or trees. Leaves opposite or ternate; stipules intrapetiolar, usually bifid. Inflorescence a terminal, panicled, corymbose cyme; bracts and bracteoles small. Flowers 5-merous, sessile. Corolla valvate; tube usually curved. Stamens inserted in the middle of corolla tube; filaments short or 0. Ovary 2-locular; locule with 1 basal ovule. Fruit a drupe of two 1-seeded pyrenes; seeds orbicular.

Chasalia ophioxyloides (Wall.) Craib, Gard. Bull. Straits Settlem. 6: 474. 1930; Raizada, Indian Forester 92: 305. 1966. *Psychotria ophioxyloides* Wall. in Roxb., Fl. Ind. 2: 168. 1824. *Chasalia curviflora* auct. non (Wall.) Thwaites: Gamble, Fl. Madras 643(453). 1921.

Erect, glabrescent shrubs. Leaves elliptic-obovate, shortly acuminate, cuneate, to 18×6 cm. Inflorescence (including corolla) pinkish-white. Drupe globular, 8 mm long, purplish-black.

South India, Sri Lanka. Frequent in undergrowth on Ghats. All seasons. *HFP* 28, 320.

DENTELLA J. & G. Forster

Prostrate herbs, with dichotomous branches. Stipules interpetiolar, connate, scarious. Flowers 5-merous, solitary, axillary, subsessile. Calyx deeply lobed. Corolla funnel-shaped; tube hairy within; lobes valvate, short, few-toothed. Stamens 5, inserted in the middle of corolla tube; filaments short. Ovary 2-locular, with numerous axile ovules. Fruit dry, indehiscent; seeds minute, angular.

Dentella repens (L.) J. & G. Forster, Charact. 26, t. 13. 1776; Gamble, Fl. Madras 590(416). 1921. *Oldenlandia repens* L., Mant. 40. 1767.

Leaves subsessile, small, pale green. Calyx with many hyaline hairs. Corolla white. Fruit 3 mm long, globose.

Indomalaysia, Polynesia. Fairly common on loose, sandy soil across the District. April-July. *CJS* 13472, 16820.

GARDENIA J. Ellis *nom. cons.*

Shrubs or trees, rarely armed. Leaves opposite or ternate, subsessile, coriaceous; stipules intrapetiolar, often connate into a cup. Inflorescence a cyme, fascicle or flowers solitary. Calyx truncate or lobed or spathaceous. Corolla lobes contorted, 5 or more, spreading. Stamens 5 or more, inserted in the throat of corolla; filaments short or 0. Ovary 1-locular with numerous ovules on 2-6 parietal placentas. Fruit a berry, crowned with persisting calyx, woody or fleshy, dehiscing irregularly or by valves; seeds compressed.

1 Corolla tube less than 2 cm long; plants sometimes armed, not resiniferous..*G. turgida*
1 Corolla tube more than 3 cm long; plants unarmed, resiniferous.
2 Fruit with 4-5 placentas.....*G. latifolia*
2 Fruit with 2 placentas.....*G. resinifera*

Gardenia latifolia Aiton, Hort. Kew. 1: 294. 1789; Wight, Ic. t. 759. 1844; Gamble, Fl. Madras 619(436). 1921.

Small, deciduous trees, with conspicuous yellow resin. Leaves elliptic-obovate, subacute, to 16×9 cm; nerves 12-18 pairs, nervules parallel. Flowers solitary. Calyx lobes 5-9, lanceolate, acuminate. Corolla becoming yellow, 5-9-lobed. Berry globose, 3 cm across, smooth, with 4-5-placentas.

India. Collected once in fruit from Nagpuri (scrub)on March 12, 1971. *HFP* 1499.

Gardenia resinifera Roth, Nov. Pl. Sp. 150. 1821. *Gardenia lucida* Roxb., [Hort. Beng. 15. 1814, *nom.*] Fl. Ind. 2: 553. 1824; Wight, Ic. t. 575. 1942; Gamble, Fl. Madras 618(436). 1921.

Shrubs or small trees, covered with yellow resin. Leaves obovate, obtuse, cuneate-rounded, to 6×3 cm; nerves 10-20 pairs; nervules parallel. Calyx lobes 5. Corolla yellow with age, 5-lobed; tube 3-4 cm long. Berry elliptic, to 4×2.5 cm, with 2 placentas.

South W. India, Burma. Frequent in scrub. January-June. *CJS* 10674, 16572.

Gardenia turgida Roxb. [Hort. Beng. 15. 1814, *nom.*] Fl. Ind. 2: 557. 1824; Wight, Ic. t. 579. 1842; Gamble, Fl. Madras 619(437). 1921.

Deciduous shrubs-trees, sometimes spinous. Leaves obovate, obtuse-acute, cuneate, to 5×3 cm, pubescent. Staminate flowers fascicled; pistillate flowers solitary. Calyx lobes 5, short. Corolla white, 5-lobed; tube 1-1.5 cm long. Berry orbicular, yellowish-brown, with 4-6 placentas, to 6 cm across.

India, Burma. Collected once in fruit from Byra (scrub) on July 10, 1970. *HFP* 359.

HYMENODICTYON Wallich *nom. cons.*

Trees. Stipules interpetiolar, deciduous. Inflorescence a panicled cyme or raceme; bracts 1-2, foliaceous, white or colored, at the top of peduncle, persistent. Calyx lobes 5-6, ovate, subulate, deciduous. Corolla lobes 5, valvate, short. Stamens inserted in the middle of corolla tube; filaments short. Ovary 2-locular with numerous axile ovules. Fruit a capsule, loculicidally 2-valved; seeds many, flat, winged all around.

Hymenodictyon obovatum Wall. in Roxb., Fl. Ind. 2: 153. 1824; Wight, Ic. t. 1159. 1846; Bedd., Fl. Sylv. t. 219. 1872; Gamble, Fl. Madras 589(416). 1921.

Leaves obovate or elliptic, acuminate, cuneate, glabrescent. Inflorescence spicate; peduncle 12 cm long; bracts green, conspicuous. Flowers sessile. Corolla white. Capsule erect, brown, 2 cm long.

South W. India. Rare in lower Shiradi Ghat. November-February. *CJS* 16204, *HFP* 1359.

IXORA Linnaeus

Shrubs or trees. Leaves sometimes ternate; stipules interpetiolar, connate into a sheath at base, cuspidate. Inflorescence a terminal cyme or panicle; bracts foliaceous; bracteoles 2. Flowers usually in groups of threes, 4-merous, sessile. Calyx limb persistent. Corolla funnel or salver shaped, contorted. Stamens inserted in the mouth of corolla; filaments short or 0; anthers bifid at base; connective mucronate. Ovary 2-locular, with solitary, axile ovule per locule; style slightly exserted. Fruit a drupe of one to two, 1-seeded pyrenes, globose or slightly 2-lobed.

1 Calyx lobes 3 mm or longer, exceeding ovary.
2 Calyx lobes oblong-lanceolate; peduncles with dense white hairs.....*I. polyantha*
2 Calyx lobes linear-lanceolate; peduncles pubescent.....*I. leucantha*
1 Calyx lobes less than 2 mm long, equaling or shorter than ovary.
3 Calyx glabrous.....*I. nigricans*
3 Calyx pubescent.
4 Peduncle more than 10 cm long.....*I. elongata*
4 Peduncle less than 6 cm.....*I. arborea*

Ixora arborea Roxb. ex J. E. Sm. in Rees, Cyclop. 19: 5. 1811; Sant., Fl. Khandala ed. 3, 119. 1967. *Ixora parviflora* Vahl, Symb. 3: 11, t. 52. 1794, non Lam., 1791; Wight, Ic. t. 711. 1843; Bedd., Fl. Sylv. t. 222. 1872; Gamble, Fl. Madras 631(445). 1921.

Shrubs or trees. Leaves elliptic-lanceolate, subacute, acute-cordate, coriaceous. Peduncle 3-5 cm long, reddish-brown. Buds ellipsoid. Calyx teeth obscure. Corolla white, shortly lobed; tube to 7 mm long. Style hairy. Drupe red, to 5×8 mm, slightly lobed.

India, Sri Lanka, Burma. Scattered across the plain and in upper Ghats. November-June. *CJS* 16375, *HFP* 2647.

Ixora elongata Heyne ex G. Don, Gen. Syst. 2: 371. 1834; Gamble, Fl. Madras 630(445). 1921.

Shrubs. Leaves broadly elliptic-oblong, obtuse, cuneate, to 25×10 cm, chartaceous. Inflorescence congested; peduncle to 25 cm long. Calyx pubescent, teeth 2 cm long, equaling ovary. Corolla pinkish-white, pubescent, shortly lobed; tube 1.6 cm long. Drupe black with age, slightly 2-lobed.

South W. India. Occasional across the Ghats. December-May. *HFP* 127, 2659.

Ixora leucantha Heyne ex G. Don, Gen. Syst. 3: 572. 1834.

var. **malabarica** Gamble, Fl. Madras 630(444). 1921.

Shrubs. Leaves elliptic-lanceolate, acuminate, acute-rounded, to 15×4 cm, coriaceous. Inflorescence pubescent; peduncle 3 cm long. Calyx

lobes 3-4 mm long, longer than ovary. Corolla creamy yellow; tube 1.7 cm long; lobes 1.2 cm long.

South W. India. Occasional in upper Bisle Ghat. November-January. *CJS* 11686, 15777.

Ixora nigricans R. Br. ex Wight & Arn., Prodr. 428. 1834; Wight, Ic. t. 318. 1840; Gamble, Fl. Madras 631(445). 1921.

Shrubs. Leaves oblong-obovate, to 10×3.5 cm, chartaceous, turning black after drying. Peduncle 2 cm long. Calyx teeth to 2 mm long, shorter than ovary. Corolla white, shortly lobed, to 1.2 cm long. Drupe 6 cm across, dark brown with age.

Indomalaysia. Occasional across the Ghats. All seasons. *CJS* 12047, *HFP* 1530.

Ixora polyantha Wight, Ic. t. 1066, 1846; Gamble, Fl. Madras 629(444). 1921.

Shrubs. Leaves elliptic-lanceolate, shortly acuminate, cuneate, to 25×10 cm. Inflorescence densely white-hairy; peduncle 3-5 cm long. Calyx lobes 6 mm long, longer than ovary. Corolla white, shortly lobed; tube to 3 cm long. Drupe 1 cm across, yellowish-red.

South W. India. Collected once in fruit from lower Bisle Ghat on 4 July 1969. *CJS* 14233.

KNOXIA Linnaeus

Herbaceous or suffrutescent; branches angled or terete. Stipules interpetiolar, connate into a sheath. Inflorescence a terminal panicled cyme. Flowers 4-merous, subsessile. Calyx limb persistent. Corolla funnel-shaped, valvate; throat hairy. Stamens inserted below the throat of corolla; filaments short or 0. Ovary 2-locular, with solitary pendulous ovule per locule. Fruit of two 1-seeded, indehiscent mericarps.

Knoxia sumatrensis (Retz.) DC., Prodr. 4: 569. 1830; Backer & Bakh. f., Fl. Java 2: 318. 1965. *Spermacoce sumatrensis* Retz., Obs. Bot. 4: 23. 1786. *Knoxia corymbosa* auct. non Willd., 1797; Gamble, Fl. Madras 622(439). 1921.

Erect herbs; stem woody at base. Stipules with subulate, hirsute bristles. Leaves oblong-lanceolate, to 12×2.5 cm. Panicle corymbose; peduncle 1-10 cm long. Calyx lobes subequal. Corolla purplish-blue. Mericarps semiterete.

Indomalaysia. Scattered across the District. All seasons. *CJS* 14207, *HFP* 1070.

LASIANTHUS Jack *nom. cons.*

Shrubs, often foetid. Leaves distichous; stipules interpetiolar. In-

florescence an axillary fascicle, cyme or head. Flowers 3-7-merous, subsessile. Calyx truncately lobed. Corolla salverform, valvate; throat hairy. Stamens inserted in the throat of corolla; filaments short. Ovary 4-9-locular, with solitary basal ovule per locule; style with 4-9 stigmatic lobes. Fruit a drupe of four to nine 1-seeded pyrenes.

Lasianthus acuminatus Wight, Calcutta J. Nat. Hist. 6: 511. 1845; Gamble, Fl. Madras 647(456). 1921.

Leaves elliptic-lanceolate, long-acuminate, rounded, to 14×4 cm, with 5-6 pairs of arching nerves and parallel nervules, glabrescent. Cyme sessile, ebracteate. Flowers usually 4-merous. Calyx lobes triangular, hairy. Corolla white. Drupe subglobose, 4-locular.

South W. India. Occasional in upper Ghats. January-September. *CJS* 14580, *HFP* 41.

MEYNA Roxburgh ex Link

Shrubs or trees, often spinous. Leaves opposite or ternate; stipules interpetiolar, connate. Inflorescence a cyme, fascicle or panicle. Flowers polygamous, 4-6-merous. Calyx toothed or lobed. Corolla tube globose, hairy within, valvate. Stamens inserted at the mouth of corolla; filaments short or 0. Ovary generally 5-locular, with solitary, pendulous ovule per locule. Fruit a drupe of three to five 1-seeded pyrenes.

Meyna laxiflora Robyns, Bull. Jard. Bot. Etat 11: 228. 1928; Sant., Fl. Khandala ed. 3, 118. 1967. *Vangueria spinosa* Roxb., Fl. Ind. 2: 172. 1824, pro parte, excl. typ.; Gamble, Fl. Madras 626(442). 1921.

Thorny, small trees. Leaves elliptic-lanceolate, acuminate, to 12×6 cm. Cyme short, lax. Pedicels to 3 cm. Corolla greenish-white. Drupe ellipsoid, 2 cm across, dry.

Indomalaysia. Occasional in upper Ghats. January-August. *CJS* 12975, 16931.

MITRACARPUS Zuccarini

Note: Anderson (*Taxon* 20: 643. 1971) has clearly established that the original spelling of this genus in nominative singular is *Mitracarpus*, not *Mitracarpum*. Support for Anderson's position is that in the Index of Schultes' work this taxon is listed as *Mitracarpus scaber*.

Herbs. Branches 4-angled. Leaves sessile. Stipules interpetiolar, forming a pectinate sheath. Flowers fascicled; bracteoles filiform. Calyx unequally 4-lobed. Corolla funnel-shaped, shortly 4-lobed, valvate. Stamens 4, at the mouth of corolla; filaments short or 0. Ovary 2-locular, with solitary axile ovule per locule. Fruit circumscissile.

Mitracarpus verticillatus (K. Schum.) Vatke, Linnaea 40: 196. 1876; Sebastine & Ramamurthy, Bull. Bot. Surv. India 9: 291. 1967. *Staurospermum verticillatum* K. Schum., Beskr. Guin. Pl. 73. 1827. *Mitracarpus scaber* Zucc. in Schultes & Schultes, Mant. 3: 210. July-Dec. 1827.

Pubescent herbs. Leaves ovate-lanceolate, to 5×1.5 cm. Corolla white. Seeds 4-furrowed on one side.

Tropical Africa. Collected once in flower and fruit at lower Shiradi Ghat on January 7, 1970. *CJS* 16004.

Note: We adopt *M. verticillatus* as the correct name for the plant. However, this needs verification.

MITRAGYNA Korthals *nom. cons.*

Shrubs or trees. Stipules interpetiolar, caducous. Inflorescence of solitary or panicled heads; peduncle with 2 caducous bracts at apex; bracteoles paleaceous. Calyx truncate. Corolla funnel-shaped, hairy within; lobes 5-6, lanceolate, valvate. Stamens 5-6, inserted at the throat of corolla; filaments short; anthers apiculate. Ovary 2-locular, with many pendulous ovules per locule. Fruit a capsule, separating into two many-seeded cocci.

Mitragyna parviflora (Roxb.) Kunth, Obs. Naucl. Ind. 19. 1839; Gamble, Fl. Madras 585(413). 1921. *Nauclea parviflora* Roxb., Pl. Cor. t. 52. 1795; Bedd., Fl. Sylv. t. 34. 1869.

Deciduous trees. Leaves suborbicular-ovate, obtuse-acute, to 8×5 cm. Heads usually solitary, shortly peduncled, 5 cm across. Calyx limb short. Corolla creamy white, sparsely pilose within. Capsules in globose heads.

India, Burma, Sri Lanka. Occasional trees across plains. April-August. *HFP* 72, 278.

MORINDA Linnaeus

Shrubs or trees. Stipules interpetiolar, connate, sheathing. Inflorescence a simple or panicled head; peduncle bracteate. Flowers polygamous, 4-6-merous. Calyx tubes cohering; limb short, truncate, sometimes with 1-2 foliaceous lobes. Corolla funnel-shaped, valvate. Stamens inserted in the corolla tube; anthers exserted. Ovary 2-locular or incompletely 4-locular, with solitary, sub-basal ovule per locule. Fruit a fleshy syncarp of 1-seeded pyrenes.

Morinda tomentosa Heyne ex Roth, Nov. Pl. Sp. 147. 1821; Backer & Bakh. f., Fl. Java 2: 351. 1965. *Morinda tinctoria* Roxb., [Hort.

Beng. 15. 1814, *nom.*] Fl. Ind. 2: 197. 1824, non Noronha, 1790. *Morinda tinctoria* var. *tomentosa* (Roth) J. Hooker, Fl. Brit. India 3: 156. 1880; Gamble, Fl. Madras 652(459). 1921.

Shrubby trees. Stipules bifid. Leaves elliptic-lanceolate, acuminate, to 15×6 cm, hairy. Corolla white; tube to 2.5 cm long, sparsely hairy. Syncarpium 2 cm across.

Indomalaysia. Common near Nagpuri (scrub) and occasional in other parts of plain. March-September. *CJS* 16615, *HFP* 153.

MUSSAENDA Linnaeus

Usually shrubs. Leaves opposite or ternate; stipules interpetiolar, bifid, deciduous; scar with a ring of hairs. Inflorescence a terminal cyme; bracts and bracteoles deciduous. Flowers 5-6-merous. Calyx lobes linear, often one of them expanded into a showy bract. Corolla hypocrateriform, valvate; throat villous. Stamens inserted in the corolla tube. Ovary 2-locular, with many axile ovules. Fruit a berry or capsule.

Mussaenda laxa (J. Hooker) Hutch. ex Gamble, Fl. Madras 610(430). 1921. *Mussaenda frondosa* L. var. *laxa* J. Hooker, Fl. Brit. India 3: 89. 1880.

Branchlets and leaves glabrous with age. Stipules to 1 cm long, hairy outside. Leaves elliptic-orbicular, to 12×6 cm. Cymes densely hirsute. One of the calyx lobes transformed into a showy petiolate bract. Corolla red-yellow; tube 3 cm long. Berry ovoid, 1 cm across, glabrescent.

Western Ghats. Frequent across the Ghats. All seasons. *HFP* 2166, 2208.

MYCETIA Reinwardt

Stipules interpetiolar. Leaves membranous. Inflorescence an axillary, panicled, lax cyme; bracts often glandular. Flowers 4-6-merous. Calyx lobes persistent. Corolla valvate. Stamens inserted in the corolla tube; filaments short. Ovary 2-6-locular, with many axile ovules. Fruit a berry or capsule.

Mycetia acuminata (Wight) Kuntze, Rev. Gen. Pl. 289. 1891; Gamble, Fl. Madras 612(431). 1921. *Lawia acuminata* Wight, Ic. t. 1070. 1846.

Leaves long-petioled, elliptic-lanceolate, acuminate, cuneate, to 25×9 cm. Corolla yellow, shortly tubular. Berry 5-6-locular, globose, white.

South W. India. Collected once in flower at lower Shiradi Ghat on March 25, 1969. *CJS* 13159.

NEANOTIS Lewis

Herbs. Stipules interpetiolar, usually with narrow lobes. Inflorescence a head, cyme or fascicle; bracts and bracteoles small. Flowers 4-merous, subsessile. Calyx lobes well separated, persistent. Corolla funnel-shaped, valvate. Stamens at the mouth of corolla; filaments short or 0. Ovary 2-4-locular with few axile ovules per locule. Fruit a loculicidal capsule, 2-5-seeded per locule.

1 Leaves linear-lanceolate; style 2-fid.....*N. foetida*
1 Leaves ovate; style 3-4-fid.....*N. quadrilocularis*

Neanotis foetida (Dalzell) W. H. Lewis, Ann. Missouri Bot. Gard. 53: 38. 1966. *Hedyotis foetida* Dalzell, Hooker's J. Bot. Kew Gard. Misc. 2: 134. 1850. *Anotis foetida* (Dalzell) J. Hooker, Fl. Brit. India 3: 74. 1880; Gamble, Fl. Madras 605(427). 1921.

Wiry, erect herbs. Leaves linear, to 2×0.2 cm. Cymes on capillary peduncles, 2-3-flowered. Corolla purple, white or pink. Ovary 2-locular; style bifid.

Western Ghats. Fairly common in upper Ghats. On grassy slopes or in crevices of rocks or tree trunks. August-September. *CJS* 11198, *HFP* 1982.

Note: According to W. H. Lewis (*l.c.*) *Anotis* DC. is restricted to the New World. He proposed a new generic name '*Neanotis*' for the related but distinct species of the Old World. The new generic name is being accepted here although the circumscription of '*Neanotis*' would seem to require a Latin diagnosis if it were a new taxonomic concept and not just a renaming of a previously existing taxon.

Neanotis quadrilocularis (Thwaites) W. H. Lewis, Ann. Missouri Bot. Gard. 53: 40. 1966. *Hedyotis quadrilocularis* Thwaites, Enum. 144. 1857; Bedd., Ic. t. 28. 1874. *Anotis quadrilocularis* (Thwaites) J. Hooker, Fl. Brit. India 3: 74. 1880; Gamble, Fl. Madras 605(427). 1921.

Slender herbs, rooting at basal nodes. Leaves petioled, ovate, subacute, to 3×1.5 cm. Cymes axillary and sessile or terminal and peduncled. Corolla purple, white or pink. Ovary 3-4-locular; style 3-4-fid.

South W. India, Sri Lanka. Frequent in upper Ghats. August-October. *CJS* 10246, 11207.

NEONAUCLEA Merrill

Shrubs or trees. Stipules interpetiolar, oblong, deciduous. Inflorescence a head, solitary or 2-3-fascicled; peduncle articulate. Flower 5-merous. Calyx lobes triangular. Corolla funnel-shaped; lobes short, imbricate, appendiculate outside below the apex. Stamens inserted at

the throat of corolla; filaments short. Ovary 2-locular with many pendulous ovules; style exserted; stigma globose. Fruit a 2-valved capsule; seeds winged.

Neonauclea purpurea (Roxb.) Merrill, Interp. Rumph. Herb. Amboin. 483. 1917; Gamble, Fl. Madras 584(412). 1921. *Nauclea purpurea* Roxb., Pl. Cor. t. 54. 1796. *Nauclea elliptica* auct. non Dalz. & Gibson: Bedd., Ic. t. 19. 1874.

Medium trees. Leaves elliptic-lanceolate, to 16×6 cm. Peduncle 4-6-cm long, becoming woody. Heads 4 cm across. Corolla creamy white.

South W. India. Occasional tree in lower Ghats. March-June. *CJS* 16780, *HFP* 1546.

NEUROCALYX W. Hooker

Herbaceous or suffrutescent. Leaves crowded toward apices of branches, membranous; stipules interpetiolar, large, bifid. Inflorescence an axillary, pendulous raceme or head; bracts simple, toothed or partite. Flowers 5-merous. Calyx tube ridged; lobes ovate, acute, persistent. Corolla rotate; lobes smaller than calyx lobes, valvate. Stamens inserted near base of corolla; filaments very short; anthers connate. Ovary 2-locular with numerous axile ovules. Fruit dry or fleshy, dehiscing irregularly.

Neurocalyx calycinus (Benn.) Robinson, Proc. Amer. Acad. Arts 45: 402. 1910; Henry, Bull. Bot. Surv. India 9: 290. 1967. *Argostemma calycinum* R. Br. ex Benn., Pl. Jav. Rar. 97. June 1838. *Neurocalyx hookerianus* Wight, Ic. t. 52. Sept. 1838 ('*hookeriana*') *Neurocalyx wightii* Arn., Ann. Nat. Hist. ser. 1, 3: 22. 1839; Gamble, Fl. Madras 591(417). 1921.

Stem woody, short. Stipules bract-like, to 2×1 cm. Leaves oblanceolate, shortly acuminate, cuneate, glaucous beneath, to 30×6 cm. Peduncle shorter than leaves. Flowers creamy white.

South W. India. Common in Kagenari State Forest (lower Shiradi Ghat). March-July. *HFP* 1531, 1912.

OLDENLANDIA Linnaeus

Usually herbs. Leaves opposite or whorled; stipules interpetiolar, connate into a bristly sheath. Inflorescence a cyme, fascicle or flowers solitary. Flowers 4-5-merous. Calyx lobes distant, persistent. Corolla lobes valvate. Stamens inserted above the middle of corolla; anthers

included or exserted. Ovary 2-locular with numerous axile ovules. Fruit usually a loculicidal or septicidal capsule; seeds angular, minute.

1 Leaves whorled.....*O. aspera*
1 Leaves opposite.
2 Leaves more than 8 mm broad.
3 Nerves distinct beneath; fruit indehiscent.....*O. auricularia*
3 Nerves indistinct; fruit dehiscent at the top only.....*O. nitida*
2 Leaves less than 8 mm broad.
4 Stem scabrid; stunted herbs with woody base-stock.....*O. wightii*
4 Stem not scabrid; slender herbs.
5 Capsule late dehiscent; leaves aristate; flowers subsessile, fascicled.....*O. caerulea*
5 Capsule loculicidal; leaves acute; flowers pedicelled, if subsessile not fascicled.
6 Upper inflorescences many-flowered and panicled.....*O. affinis*
6 All inflorescences 1-4-flowered.
7 Tip of capsule round, protruding; erect herbs.....*O. herbacea*
7 Tip of capsule flat; herbs often diffuse.....*O. corymbosa*

Oldenlandia affinis (Roemer & Schultes) DC., Prodr. 4: 428. 1830. *Hedyotis affinis* Roemer & Schultes, Syst. 3: 194. 1818. *Hedyotis dichotoma* Heyne ex Roth, Nov. Pl. Sp. 93. 1821. *Hedyotis heynei* auct. non R. Br. ex Wight & Arn., 1834: Bedd., Ic. t. 33. 1874. *Oldenlandia dichotoma* (Roth) J. Hooker, Fl. Brit. India 3: 67. 1880, non Sprengel. 1815; Gamble, Fl. Madras 601(424). 1921.

Leaves linear-lanceolate, to 5 × 0.5 cm. Cymes in upper axils, panicled, many-flowered; pedicels to 1.4 cm long. Corolla funnel-shaped, blue. Stamens inserted in the throat of corolla. Capsule loculicidal.

South W. India. Common in Nagpuri (scrub). July-October. *CJS* 14104, *HFP* 1081.

Oldenlandia aspera (Roth) DC., Prodr. 4: 428. 1830; Gamble, Fl. Madras 602(424). 1921. *Hedyotis aspera* Heyne ex Roth, Nov. Pl. Sp. 94. 1821. *Kohautia aspera* (Roth) Bremek., Verh. Kon. Ned. Akad. Wetensch., Afd. Natuurk., Tweede Sect. 11, 48(2): 113. 1952.

Leaves whorled, lanceolate, to 5 × 0.6 cm. Cyme terminal, panicled, lax. Flowers 1-few-fascicled, subsessile. Corolla pale blue or pink, tubular. Anthers included. Capsule loculicidal, white-dotted.

India, Pakistan. Collected once in flower and fruit at Belvathally (scrub) on August 13, 1971. *HFP* 1957.

Oldenlandia auricularia (L.) K. Schum. in Engl. & Prantl, Pflanzenfam. 4: 25. 1891; Gamble, Fl. Madras 597(421). 1921. *Hedyotis auricularia* L., Sp. Pl. 101. 1753; Bedd., Ic. t. 27. 1874. *Exallage auricularia* (L.) Bremk., Verh. Kon. Ned. Akad. Wetensch., Afd. Natuurk., Tweede Sect. 11, 48(2): 142. 1952.

Diffuse herbs. Stem 4-angled. Leaves ovate-lanceolate, to 5 × 2 cm; nerves few, distinct beneath. Cymes axillary, sessile. Flowers

pedicelled. Corolla white. Anthers included or partially exserted. Fruit indehiscent.

Indomalaysia. Occasional in upper Ghats. April-October. *CJS* 10118, 13663.

Oldenlandia caerulea (Wight & Arn.) Gamble, Fl. Madras 597(421). 1921. *Hedyotis caerulea* Wight & Arn., Prodr. 412. 1834; Bedd., Ic. t. 30. 1874.

Subscabrid herbs. Leaves linear, aristate, to 2 cm long. Flowers in fascicles, subsessile. Corolla nearly rotate, blue. Stamens exserted. Capsule late dehiscent.

South India. Fairly common on grassy slopes of upper Ghats. September-November. *CJS* 15533, *HFP* 2302.

Oldenlandia corymbosa L., Sp. Pl. 119. 1753; Gamble, Fl. Madras 600(423). 1921.

Leaves linear-lanceolate, to 3×0.2 cm. Inflorescence an umbel or fascicle. Corolla white. Stamens included. Capsule loculicidal.

Tropics. Scattered across the plain and in upper Ghats. April-September. *CJS* 13337, *HFP* 2091.

Note: Some collections (*CJS* 9553, 9676, 9677, 9678, 13097 and *HFP* 1119) intergrade between *Oldenlandia diffusa* (flowers solitary) and *O. corymbosa* (flowers not solitary) but differ from them in possessing exserted stamens. We consider these as variants and include them in *O. corymbosa.*

Oldenlandia herbacea (L.) Roxb., Fl. Ind. 1: 445. 1820; Gamble, Fl. Madras 601(424). 1921. *Hedyotis herbacea* L., Sp. Pl. 102. 1753.

Stem 4-angled. Leaves linear-lanceolate, to 3×0.2 cm. Corolla white. Anthers partially exserted. Capsule loculicidal, with protruding crown.

Paleotropics. Frequent in upper Ghats and across the plain. October-December. *CJS* 15270, *HFP* 1191.

Oldenlandia nitida (Wight & Arn.) Gamble, Fl. Madras 597(421). 1921. *Hedyotis nitida* Wight & Arn., Prodr. 412. 1834. *Hedyotis glabella* R. Br. ex Bedd., Ic. t. 36. 1874.

Trailing herbs. Leaves elliptic-lanceolate, to 3×1.4 cm, rigid; nerves indistinct. Flowers in axillary fascicles, subsessile. Corolla white. Stamens exserted. Capsule ovoid, dehiscing at the top only.

South W. India, Sri Lanka. Occasional across Shiradi Ghat. May-October. *HFP* 412, 2028.

Oldenlandia wightii J. Hooker, Fl. Brit. India 3: 66. 1880; Gamble, Fl. Madras 601(424). 1921.

Scabrid herbs. Leaves linear-lanceolate, revolute, to 2.5×0.3 cm. Peduncles in upper axils, umbellate, 3-many-flowered. Corolla white-purplish. Stamens exserted. Capsule hemispherical, scabrid, loculicidal.

South W. India. Scattered on dry sandy soil across the plain. All seasons. *CJS* 11918, *HFP* 144.

OPHIORRHIZA Linnaeus

Large herbs. Stipules interpetiolar, cuspidate, sometimes bifid, deciduous. Inflorescence a secund, dichotomous cyme. Flowers 5-merous. Calyx lobes linear. Corolla lobes valvate, often winged on the back and with a fold in the sinus. Stamens inserted in the corolla tube. Disc 2-lobed. Ovary 2-locular, with many basal ovules. Fruit a capsule, obcordate, compressed, girt in the middle by calyx limb, loculicidal.

Ophiorrhiza hirsutula Wight ex J. Hooker, Fl. Brit. India 3: 81. 1880; Gamble, Fl. Madras 608(429). 1921.

Plants rooting at nodes, rusty-pubescent. Leaves elliptic-lanceolate, to 8×3 cm. Cyme corymbose; bracteoles linear, sub-persistent. Corolla hirsute, pink-white; lobes winged on the back.

Western Ghats. Frequent in forest undergrowth of Ghats. May-October. *CJS* 14171, *HFP* 218.

PAVETTA Linnaeus

Shrubs or small trees. Stipules interpetiolar, sheathing, acuminate. Inflorescence a panicle or corymb; bracts membranous. Flowers 4-merous. Calyx toothed. Corolla funnel-shaped; lobes contorted. Stamens inserted at the mouth of corolla; filaments short or 0. Ovary 2-locular, with solitary axile ovule per locule; style long-exserted. Fruit a drupe, subglobose or 2-lobed, 1-pyrenous, 2-seeded.

1 Leaves tomentose beneath.....*P. tomentosa*
1 Leaves glabrescent.
2 Corolla tube 2.5-3 cm long; flowering shoot green.....*P. thomsonii*
2 Corolla tube 1-1.5 cm long; flowering shoot with cork up to inflorescence.....*P. indica*

Pavetta indica L., Sp. Pl. 110. 1753; Gamble, Fl. Madras 1880(1301). 1936.

Leaves elliptic-lanceolate, to 18×6 cm. Flowering shoot covered with cork to inflorescence. Corymb terminal. Calyx minutely toothed. Corolla white; tube 1-1.2 cm long, sparsely pilose within. Drupe globose, 6 mm across.

South India. Scattered in upper Ghats and western plain. January-May. *CJS* 13398, *HFP* 1445.

Pavetta thomsonii Bremek., Feddes Repert. 34: 99. 1934; Gamble, Fl. Madras 1879(1300). 1936.

Leaves elliptic-obovate, glabrous, to 15×5 cm. Flowering shoot green, without cork. Corymb glabrous or pubescent. Calyx teeth subequaling tube. Corolla creamy white; tube 2.5-3 cm long, slightly pilose within.

South W. India. Occasional in upper Ghats. December-June. *CJS* 13042, *HFP* 1778.

Pavetta tomentosa Roxb. ex J. E. Sm. in Rees, Cyclop. 26: 2. 1819; Gamble, Fl. Madras 1880(1301). 1936. *Pavetta indica* var. *tomentosa* (J. E. Sm.) J. Hooker, Fl. Brit. India 3: 150. 1880.

Young parts tomentose. Leaves elliptic-lanceolate, to 9×4 cm. Flowering shoot covered with cork to inflorescence. Calyx teeth minute. Corolla white; tube to 1 cm long, pilose within. Drupe subglobose, 5 mm across.

India. Scattered in scrub and on plain. April-October. *CJS* 11140 *HFP* 1585.

PSYCHOTRIA Linnaeus *nom. cons.*

Usually shrubs. Stipules interpetiolar, entire or bifid. Leaves usually elliptic-lanceolate. Inflorescence a terminal cyme. Flowers 4-6-merous, subsessile. Calyx campanulate; limb truncate to lobed, subpersistent. Corolla usually white, tube short, often with a ring of hairs within; lobes valvate. Stamens inserted at throat of corolla, exserted or included. Ovary 2-locular, locule with solitary, basal ovule; style short. Fruit a drupe with two 1-seeded pyrenes.

1 Flowers with rufous hairs at base; stipules suborbicular, keeled, caudate.....*P. nigra*
1 Flowers without rufous hairs; stipules various, not caudate.
2 Stipules over 1 cm long.
3 Flowers capitate; bracts persistent, 7 mm across.....*P. dalzellii*
3 Flowers not capitate; bracts none or caducous.....*P. truncata*
2 Stipules less than 1 cm long.
4 Calyx truncate or minutely toothed; pyrenes smooth.....*P. flavida*
4 Calyx lobed; pyrenes furrowed on the back.
5 Leaves with domatia along the midrib below; stipules free; pyrenes 4-furrowed.....*P. octosulcata*
5 Leaves without domatia; stipules tubular; pyrenes 2-furrowed.....*P. canarensis*

Psychotria canarensis Talbot, Syst. List Bombay 113. 1894.

Stipules to 3 mm, tubular. Leaves acuminate, cuneate, to 10×4 cm. Peduncle to 2 cm long; branches opposite or whorled. Calyx lobed. Drupe oblong, to 1×0.4 cm; pyrenes 2-furrowed.

Western Ghats. Frequent across Ghats. May-November. *CJS* 13390, *HFP* 2835.

Psychotria dalzellii J. Hooker, Fl. Brit. India 3: 163. 1880; Gamble, Fl. Madras 640(451). 1921.

Stipules oblong, obtuse, free, apparently interpetiolar, 1.5-2 cm long. Leaves obtuse, cuneate, to 25×10 cm, coriaceous. Branches of peduncle whorled; bracts and bracteoles conspicuous, persistent. Flowers capitate. Calyx truncate. Drupe ovoid, 1 cm long, crowned with calyx limb; pyrenes smooth.

South W. India. Frequent in lower Ghats. May-October. *HFP* 133, 845.

Psychotria flavida Talbot, Syst. List Bombay 113. 1894; Gamble, Fl. Madras 641(452). 1921.

Stipules ovate, acute, free, to 1 cm long. Leaves shortly acuminate, cuneate, to 20×8 cm. Branches of peduncle opposite. Calyx minutely toothed. Drupe subglobose, 6 mm across; pyrenes smooth.

Western Ghats. Occasional in lower Shiradi Ghat. May-August. *CJS* 10990, 11752.

Psychotria nigra (Gaertner) Alston in Trimen, Handb. Fl. Ceylon 6: 152. 1931. *Grumilea nigra* Gaertner, Fruct. 1: 138, t. 28. 1788. *Psychotria thwaitesii* J. Hooker, Fl. Brit. India 3: 162. 1880; Gamble, Fl. Madras 640(451). 1921.

Stipules suborbicular, caudate, with rufous hairs within, to 1.5 cm. Leaves subacuminate, to 15×5 cm. Branches of peduncle whorled. Flowers subcapitate. Calyx lobed, persistent. Drupe ellipsoid, to 8 mm across; pyrenes smooth.

South W. India, Sri Lanka. Scattered across the Ghats. All seasons. *CJS* 11126, *HFP* 1661.

Note: J. Hooker (*l.c.*) recognized *Psychotria thwaitesii* var. *zeylanica* with "cymes peduncled, branches distinct" and *P. thwaitesii* var. *peninsularis* with "leaves usually smaller, more obovate, cymes always sessile, branches moderate or short or 0, or the inflorescence a peduncled globose head." Our specimens appear to represent var. *peninsularis* except for *CJS* 11126 and 15974 which appear to be var. *zeylanica*.

Psychotria octosulcata Talbot, J. Bombay Nat. Hist. Soc. 11: 237, t. 7. 1897; Gamble, Fl. Madras 642(453). 1921.

Stipules free, acute, to 5 mm. Leaves obovate, acuminate, cuneate, to 12×5 cm, with domatia along the midrib below. Branches of peduncle opposite and whorled. Flowers capitate. Calyx lobed. Drupe obovoid; pyrenes 4-furrowed on the back.

Western Ghats. Occasional in upper Ghats and western plain. March-August. *CJS* 14015, *HFP* 373.

Psychotria truncata Wall. in Roxb., Fl. Ind. 2: 162. 1824; Gamble, Fl. Madras 640(451). 1921.

Stipules ovate, acute, free, imbricate, to 2 cm. Leaves shortly acuminate, cuneate, coriaceous. Branches of peduncle whorled. Calyx truncate. Drupe ovoid, crowned with calyx; pyrenes smooth.

South W. India. Occasional in upper Ghats. February-June. *HFP* 200, 2605.

RANDIA Linnaeus

Shrubs or trees, often spinous. Leaves opposite, often with one of each pair aborted, usually with domatia. Stipules interpetiolar, free or connate. Inflorescence axillary or leaf-opposed. Flowers 5-10-merous. Corolla lobes contorted. Ovary 1-locular or spuriously 2-locular, with the placentas from the ovary wall meeting in the center; locule many-ovuled. Fruit a berry.

Randia rugulosa (Thwaites) J. Hooker, Fl. Brit. India 3: 113. 1880; Gamble, Fl. Madras 617(435). 1921. *Griffithia rugulosa* Thwaites, Enum. 159. 1859. *Griffithia speciosa* Bedd., Ic. t. 37. 1874.

Unarmed, climbing shrubs. Leaves elliptic-lanceolate, acuminate, rounded, to 14×6 cm. Cyme leaf-opposed, short-peduncled, many-bracteate. Flowers 5-merous, long-pedicelled. Calyx minutely toothed. Corolla creamy white. Berry globose, 8 mm across.

South W. India, Sri Lanka. Occasional in upper Ghats. December-July. *CJS* 13359, *HFP* 1351.

RUBIA Linnaeus

Often scabrid herbs. Stem slender, 4-angular. Stipules petioled, foliaceous, opposite. Leaves opposite, appearing whorled due to foliar stipules, palminerved. Inflorescence a cyme. Flowers 4-6-merous. Corolla nearly rotate, valvate. Anthers partially exserted. Ovary 2-locular with solitary basal ovule per locule; style short, deeply divided; stigmas capitate. Fruit a berry, globose or didymous.

Rubia cordifolia L., Syst. Nat. ed. 12, 3: 229. 1768; Gamble, Fl. Madras 655(462). 1921. *Rubia munjista* Roxb., Fl. Ind. 1: 383. 1820; Wight, Ic. t. 187. 1839.

Climbing, scabrid herbs. Petiole 4-7 cm long; leaf blade ovate, acuminate, cordate, to 5×3 cm. Flowers greenish-white. Berry deep purple.

Paleotropics. Occasional in upper Ghats and plain. August-January. *CJS* 12182, *HFP* 2066.

SAPROSMA Blume

Foetid shrubs. Stipules interpetiolar, connate, with rigid bristles along the margin, deciduous. Inflorescence with corky, involucral bracts.

Flowers 4-6-merous, subsessile. Calyx limb dilated, with acute lobes. Corolla throat pilose; lobes valvate, with inflexed or crisped margin. Anthers included. Ovary 2-locular, with solitary, basal ovule per locule. Fruit a drupe, with one or two 1-seeded pyrenes.

Saprosma glomerata (Gardner) Bedd., For. Man. Bot. 134/11. 1872; Sant. & Merch., Bull. Bot. Surv. India 3: 110. 1961. *Dysodidendron glomeratum* Gardner, Calcutta J. Nat. Hist. 7: 3. 1847. *Serissa glomerata* (Gardner) Bedd., Ic. t. 16. 1874. *Saprosma indica* Dalzell, Hooker's J. Bot. Kew Gard. Misc. 3: 37. 1851; Gamble, Fl. Madras 649(457). 1921.

Leaves opposite, oblanceolate, to 12×4 cm. Flowers fascicled in upper axils, each subtended by an involucral bract. Corolla white.

South W. India. Collected once in flower at Vanagur (upper Bisle Ghat) on August 21, 1969. *CJS* 14577.

TARENNA Gaertner

Usually shrubs. Stipules interpetiolar, connate. Inflorescence a terminal, corymbose cyme; bracts and bracteoles present. Flowers (4-) 5-merous. Corolla lobes contorted. Stamens inserted on the mouth of corolla; anthers exserted. Ovary 2-locular; locule 1-many-ovuled; style hairy. Fruit a berry, crowned with calyx.

1 Leaves shining; corolla tube shorter than lobes; ovary many-ovulate..... *T. asiatica*
1 Leaves dull; corolla tube longer than lobes; ovary 2-ovulate..... *T. nilagirica*

Tarenna asiatica (L.) Kuntze ex K. Schumann, Bot. Tidsskr. 24: 332. 1902. *Rondeletia asiatica* L., Sp. Pl. 172. 1753. *Chomelia asiatica* (L.) Kuntze, Rev. Gen. Pl. 1: 278. 1891; Gamble, Fl. Madras 612(432). 1921.

Young parts often resinous. Leaves elliptic-lanceolate, shortly acuminate, rounded, to 10×3 cm, coriaceous. Calyx long-lobed, persistent. Corolla tube shorter than lobes. Ovary many-ovuled. Berry 6 mm across, globose.

Indomalaysia. Frequent in scrub. All seasons. *CJS* 9737, 10680.

Note: This combination has been published by several authors including Alston (in Trimen, *Handb. Fl. Ceylon* 6: 150. 1931) and Santapau & Merchant (*Bull. Bot. Surv. India* 3: 110. 1961) but Schumann (1902) was first. The Editors are grateful to D. D. Tirvengadum, Research Fellow, Smithsonian Institution for this information.

Tarenna nilagirica (Bedd.) Bremek., Feddes Repert. 37: 197. 1934. *Pavetta nilagirica* Bedd., For. Man. Bot. 134/8. 1872. *Stylocoryne nilagirica* (Bedd.) Gamble, Fl. Madras 635(448). 1921.

Leaves elliptic-lanceolate, long-acuminate, cuneate, to 12×5 cm.

Calyx shortly lobed. Corolla white; tube longer than lobes. Ovary 2-ovuled.

Western Ghats. Collected once in flower at stream between Devalkere and Devarunde on May 7, 1970. Flowers fragrant. *HFP* 36.

WENDLANDIA Bartling ex A. P. de Candolle *nom. cons.*

Shrubs or trees. Stipules interpetiolar, entire or bifid. Inflorescence a terminal, panicled cyme; bracts and bracteoles persistent. Flowers 4-5-merous, dense. Corolla funnel-shaped; lobes imbricate. Stamens inserted on the mouth of corolla; anthers exserted. Ovary usually 2-locular with numerous, axile ovules. Fruit a globose capsule.

Wendlandia thyrsoidea (Roemer & Schultes) Steudel, Nom. ed. 2, 2: 786. 1841; Sant., Fl. Khandala ed. 3, 113. 1967. *Canthium thyrsoideum* Roemer & Schultes, Syst. 6: 207. 1820. *Wendlandia notoniana* Wall. ex Wight & Arn., Prodr. 403. 1834; Wight, Ic. t. 1033. 1845; Bedd., Fl. Sylv. t. 224. 1872; Gamble, Fl. Madras 588(415). 1921.

Young parts pubescent. Leaves usually ternate, elliptic-lanceolate, acute, to 10×4 cm. Corolla pale yellow; tube longer than lobes.

South India, Sri Lanka. Frequent in upper Ghats. December-May. *CJS* 13239, 15975.

XEROMPHIS Rafinesque

Shrubs or trees, often spinous. Internodes often short. Leaves often with bearded domatia beneath. Stipules interpetiolar, caducous. Inflorescence an umbel or fascicle, on apex of brachyblasts. Flowers 5-8-merous. Calyx shortly lobed. Corolla campanulate; tube with a band of hairs within; lobes contorted, longer than tube. Anthers exserted. Ovary 2-locular with many, axile ovules. Fruit a berry.

1 Spines axillary; leaves less than 8 cm long; calyx lobes persistent.....*X. spinosa*
1 Spines terminal; leaves more than 10 cm long; calyx lobes deciduous.....*X. uliginosa*

Xeromphis spinosa (Thunb.) Keay, Bull. Jard. Bot. Etat 28: 37. 1958; Maheshwari, Bull. Bot. Surv. India 3: 91. 1962. *Gardenia spinosa* Thunb., Diss. Gard. no. 7. 1780. *Gardenia dumetorum* Retz., Obs. Bot. 2: 14. 1781. *Randia dumetorum* (Retz.) Poir. in Lam., Encycl. Suppl. 2: 829. 1812; Wight, Ic. t. 580. 1842; Gamble, Fl. Madras 615(434). 1921. *Posoqueria longispina* Roxb., Fl. Ind. 2: 566. 1824. *Randia spinosa* (Thunb.) Poir., *l.c.* *Randia longispina* (Roxb.) DC., Prodr. 4: 386. 1830; Wight, Ic. t. 582. 1842; Gamble,

Fl. Madras 616(434). 1921. *Randia brandisii* Gamble, Fl. Madras 616(434). 1921.

Spines axillary, 2-3 cm long, absent on older parts. Leaves elliptic-obovate, subacute, to 6×4 cm. Flowers 1-few-fascicled, 5-merous. Calyx lobed. Corolla pale yellow. Berry ellipsoid, 4 cm across.

Paleotropics. Scattered across the District. March-September. *CJS* 14398, *HFP* 2755.

Note: Backer & Bakh. f., (*Fl. Java* 2: 310. 1965) attribute the authorship of *Gardenia spinosa* to L. f., July-December 1781.

Xeromphis uliginosa (Retz.) Maheshwari, Bull. Bot. Surv. India 3: 92. 1961. *Gardenia uliginosa* Retz., Obs. Bot. 2: 14. 1781. *Randia uliginosa* (Retz.) DC., Prodr. 4: 386. 1830; Wight, Ic. t. 397. 1840; Gamble, Fl. Madras 615(434). 1921.

Spines terminal at the end of brachyblasts, 1.2 cm long. Leaves elliptic-lanceolate, to 15×7 cm. Flowers solitary, 6-8-merous. Calyx toothed. Corolla white.

India, Burma. Collected once in flower at Byra (scrub) on April 11, 1970. *CJS* 16785.

* * *

Coffea L. is extensively cultivated. The important cultivars are based on *C. arabica* & *C. robusta.*

127. CAPRIFOLIACEAE

K. N. Gandhi

Usually woody. Leaves generally opposite; stipules small or 0; simple or compound, entire or lobed; venation pinnate or palmate. Inflorescence mostly cymose or flowers paired, axillary and/or terminal; bracts and bracteoles conspicuous or short. Flowers usually bisexual, regular or irregular, 5-merous. Sepals free above ovary. Corolla gamopetalous, imbricate. Stamens epipetalous; anthers 2-celled. Ovary inferior, 1-8-locular; locule with solitary, pendulous ovule or few-many, axillary ovules; style erect; stigma capitate or 3-lobed. Fruit generally a drupe or berry; seeds 1-many.

1 Flowers more than 3 cm long. Berries many-seeded, paired. Leaves tomentose beneath.....**Lonicera**

1 Flowers up to 1 cm long. Drupe 1-seeded, not paired. Leaves with peltate scales beneath.....**Viburnum**

Fig. 103. CAPRIFOLIACEAE. *A. Lonicera leschenaultii*: flowering branch; *Aa*, flower. *B. Viburnum punctatum*: flower; *Ba*, flower in vertical section; *Bb*, ovary in cross section.

LONICERA Linnaeus

Nodes with a ring of hairs; leaf blade simple; venation pinnate. Inflorescence a panicle, head or of solitary or clustered flowers. Corolla usually 2-lipped, upper lip 4-toothed. Stamens inserted above the middle of corolla; filaments slender; anthers versatile. Ovary 2-3-locular, with 3-8 axillary ovules in each locule; style elongate; stigma capitate. Fruit a berry; berries free or united in pairs.

Lonicera leschenaultii Wall. in Roxb., Fl. Ind. 2: 178. 1824; Gamble, Fl Madras 577(407). 1919.

Climbing shrubs; enations softly tomentose. Petiole 1-1.5 cm long; leaf blade entire, ovate, acute-acuminate, truncate-cordate, tomentose beneath, to 8×4.5 cm. Flowers paired, axillary and also clustered toward apex forming a short, leafy panicle. Corolla pubescent, 4-6 cm long, creamy white. Berries paired but distinct, crowned with calyx segments.

South India. Occasional climbers along road cuttings and in thickets in upper Ghats. May-September. *CJS* 13467, 14021.

VIBURNUM Linnaeus

Leaves simple; venation pinnate or palmate. Inflorescence a terminal compound umbel, corymb or panicle. Flowers regular, subsessile. Corolla tubular or campanulate. Stamens inserted at the base of corolla; filaments subulate, exserted or included; anthers versatile. Ovary 1-locular, with solitary, pendulous ovule; style short; stigma 3-lobed. Fruit a drupe, ridged, shortly beaked, 1-seeded.

Viburnum punctatum Ham. ex D. Don, Prodr. Fl. Nepal. 142. 1825; Kern & Steenis in Steenis, Fl. Malesiana ser. 1, 4: 186. 1951. *Viburnum acuminatum* Wall. ex DC., Prodr. 4: 325. 1830; Wight, Ic. t. 1021. 1845; Gamble, Fl. Madras 575(406). 1919.

Small trees; enations covered with peltate scales. Petiole 1-2.5 cm long; leaf blade entire, elliptic-oblong or obovate, abruptly acuminate, attenuate, glabrous, with peltate scales beneath, to 16×6 cm; venation pinnate. Inflorescence a compound umbel, corymbiform; bracts and bracteoles persistent. Flowers white, small. Corolla lobes ovate. Stamens slightly exserted; filaments inflexed in bud; anthers oblong. Drupe ellipsoid, subcompressed, to 1×0.5 cm, with 2 dorsal and 3 ventral grooves, punctate.

Indomalaysia. Occasional evergreen tree in upper Shiradi Ghat. January-August. *HFP* 476, 1374.

128. ASTERACEAE

T. P. Ramamoorthy

Armed or unarmed, sometimes latex-bearing, erect, or procumbent, sometimes climbing, annual or perennial herbs, shrubs, rarely trees. Leaves alternate, opposite, sometimes whorled, often radical; stipules 0; blade simple, rarely compound, entire to pinnatisect, palmately or pinnately veined. Inflorescence of axillary or terminal, sessile or pedunculed, centripetal heads in spikes, racemes, corymbs etc. sometimes solitary. Heads 1-few-many-flowered, homogamous (all florets of same sex) or heterogamous (florets of different sexes), of 3 kinds: *discoid* with all florets tubular, *radiate* with only marginal florets ligulate and *ligulate* with all florets ligulate; subtended by involucre of bracts; receptacle flat or raised, glabrous to pilose, fimbriate, pitted, alveolate or paleate. Florets bisexual or unisexual, regular (tubular) or irregular (ligulate).

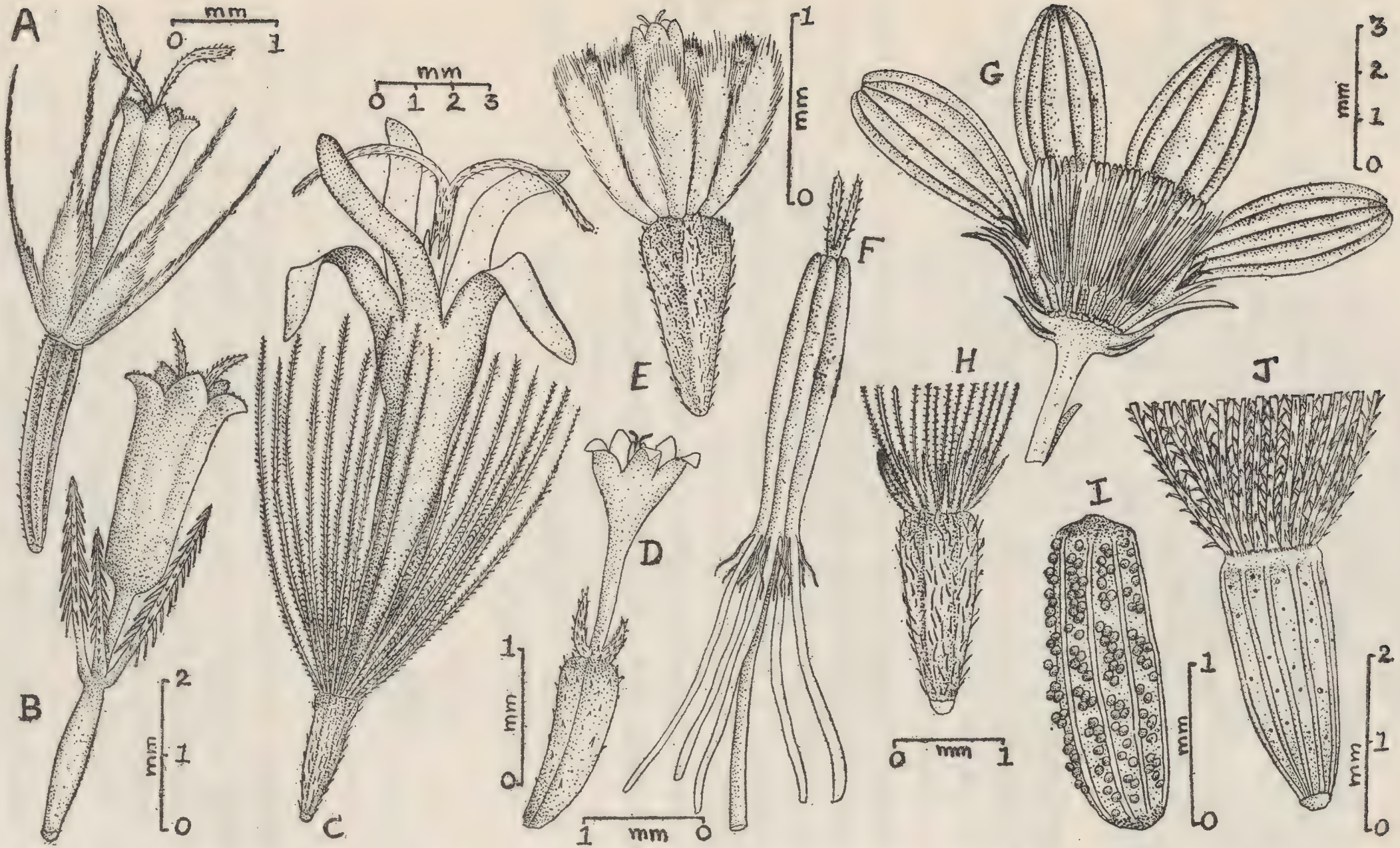


Fig. 104. ASTERACEAE. *A. Ageratum conyzoides*: flower with aristate-scaly pappus. *B. Bidens biternata*: flower with barbed pappus. *C. Vernonia dalzelliana*: flower with hairy pappus. *D. Blainvillea acmella*: flower with pappus of reduced bristles. *E. Galinsoga parviflora*: flower with scaly pappus. *F. Blumea lacera*: style and stamens with tailed anthers. *G. Senecio wightii*: vertical section of head. *H. Vernonia albicans*: achene with biseriate pappus. *I. Adenoon indicum*: glandular achene. *J. Vernonia indica*: ribbed achene.

Calyx segments (*pappus*) of bristles, hairs, scales, sometimes absent. Corolla tubular with usually 5-lobed limb or ligulate with an elongate, strap-shaped, 0-5-dentate limb. Disc present, annular, Stamens usually 5, connate by anthers (syngenesious), epipetalous, alternating with corolla-lobes; anthers 2-celled, sometimes appendaged or tailed at base; connective mostly produced into an appendage above. Ovary inferior, 1-locular; ovule 1, basal; style branching into 2 arms. Fruit an indehiscent, 1-seeded achene, compressed or terete, sometimes ribbed or angled glabrous or hairy, occasionally glandular.

1 Florets all tubular (heads discoid), outer tubular florets sometimes larger (female) than inner (bisexual) florets.
2 Plants white-woolly.
3 Involucral bracts spinescent, glabrous at base.....**Dicoma**
3 Involucral bracts acute, woolly at base.
4 Bisexual florets mostly fertile with bifid style.....**Gnaphalium**
4 Bisexual florets mostly sterile with essentially undivided style.....**Anaphalis**
2 Plants glabrous, hairy or tomentose, but not white-woolly.
5 Leaves all opposite, sometimes the upper alternate.
6 Head with 1 floret, in clusters (compound head) surrounded by foliar bracts.....
.....**Lagascea**
6 Head with many florets.
7 Pappus of 5 scales; plant aromatic; heads in paniculate corymbs.....**Ageratum**
7 Pappus of 2-many hairs; plant aromatic or not; heads in corymbs.
8 Pappus of 2-3-glandular knobs; plant not aromatic; styles long exserted, clavate
.....**Adenostemma**
8 Pappus of many hairs; plant strongly aromatic; styles exserted or not, not clavate
.....**Chromolaena**
5 Leaves all alternate.
9 Achenes enclosed in an indurate, spiny involucre; anthers not adherent to each other.....**Xanthium**
9 Achenes not enclosed in an indurate, spiny involucre; anthers adherent.
10 Florets yellow.
11 Anther bases tailed.
12 Stem not winged; pappus hairs many.....**Blumea**
12 Stem winged, trigonous; pappus hairs often wanting.....**Epaltes**
11 Anther bases obtuse, entire, not tailed.
13 Heads of equal florets (all bisexual).....**Gynura**
13 Heads with outer florets (female) distinct from inner florets (bisexual).
14 Stem distinctly winged; plant often viscid.....**Laggera**
14 Stem not winged; plant usually not viscid.
15 Erect herbs.
16 Leaf base cuneate, narrowed, never cordate.....**Conyza**
16 Leaf base cordate, amplexicaul.....**Laggera**
15 Diffuse, prostrate herbs.
17 Achenes glandular; leaves pinnatisect.....**Grangea**
17 Achenes eglandular; leaves not pinnatisect.
18 Achenes dorsally compressed; branches ascending.....**Dichrocephala**
18 Achenes 4-angled; branches prostrate.....**Centipeda**

10 Florets not yellow.
19 Leaves spinous on margin and midrib; heads with 1 floret, all united in a compound head.....**Echinops**
19 Leaves not spinous; heads with few-to-many florets.
20 Leaves deeply pinnatisect.
21 Pappus 0; leaves ashy-tomentose beneath.....**Artemisia**
21 Pappus of hairs; leaves not ashy-tomentose beneath.
22 Heads of equal florets (bisexual).....**Emilia**
22 Heads with outer florets (female) larger than inner (bisexual).....**Cyathocline**
20 Leaf margin various, not lobed more than half way to midrib.
23 Involucral bracts spiny; leaves gland-dotted.....**Tricholepis**
23 Involucral bracts not spiny; leaves not gland-dotted.
24 Stem narrowly winged; plant aromatic.....**Sphaeranthus**
24 Stem not winged; plant not aromatic.
25 Leaves mostly rosulate and few, reduced, cauline leaves above.....**Elephantopus**
25 Leaves all cauline.
26 Leaves palmately veined.....**Adenoon**
26 Leaves pinnately veined.
27 Heads heterogamous (outer florets female).....**Blumea**
27 Heads homogamous (all florets bisexual).
28 Involucral bracts 1-seriate.....**Emilia**
28 Involucral bracts 2-many-seriate.
29 Involucral bracts 2-seriate.....**Crassocephalum**
29 Involucral bracts many-seriate.
30 Involucral bracts with foliaceous upper part.....**Centratherum**
30 Involucral bracts without foliaceous upper part.....**Vernonia**
1 Florets all ligulate (heads ligulate) or only the outer ligulate (heads radiate).
31 Florets all ligulate (heads ligulate); sap milky.
32 Leaves all rosulate; achenes beaked.....**Launaea**
32 Leaves mostly cauline; achenes not beaked.....**Sonchus**
31 Outer florets ligulate (female), the inner tubular and bisexual (heads radiate); sap not milky.
33 Outer involucral bracts hooded-spinous.....**Acanthospermum**
33 Outer involucral bracts unarmed.
34 Leaves alternate.
35 Ligule filiform.....**Erigeron**
35 Ligule not filiform.
36 Leaves deeply pinnatisect.
37 Pappus a pair in outer floret, laterally reflexed.....**Parthenium**
37 Pappus more, not reflexed.
38 Head solitary, axillary; achenes ciliate.....**Glossocardia**
38 Heads in corymbs, terminal; achenes glabrous.....**Senecio**
36 Leaves never lobed more than halfway to midrib.
39 Ligule large, more than 5 cm long.....**Tithonia**
39 Ligule small, less than 4 cm long.
40 Head solitary; pappus double, the outer of scales and inner of hairs..**Pulicaria**
40 Heads corymbose or panicled; pappus single, of hairs.
41 Achenes villous.....**Vicoa**
41 Achenes glabrous.....**Senecio**
34 Leaves opposite (rarely upper leaves alternate).

42 Pappus bristles plumose.....**Tridax**
42 Pappus bristles retrorsely barbellate, not plumose.
43 Leaves deeply lobed.
44 Leaves trifoliate.....**Bidens**
44 Leaves pinnatisect.....**Cosmos**
43 Leaves crenate, not deeply lobed.
45 Outer involucral bracts glandular, clavate.....**Sigesbeckia**
45 Outer involucral bracts not glandular.
46 Receptacle not paleacous; pales not enclosing flowers.
47 Heads few-flowered, clustered, sessile, subtended by floral leaves; florets yellow.....**Flaveria**
47 Heads few-many-flowered, not fascicled, distinctly peduncled, not subtended by floral leaves; florets white.....**Eclipta**
46 Receptacle paleaceous; pales enclosing flowers.
48 Ligule large, more than 1.5 cm long.....**Guizotia**
48 Ligule small, less than 1 cm long.
49 Heads sessile, usually axillary.....**Synedrella**
49 Heads peduncled, usually axillary and terminal.
50 Receptacle raised, conical; ligules filiform, included.....**Spilanthes**
50 Receptacle flat; ligules exserted.
51 Pappus tubular.....**Galinsoga**
51 Pappus not tubular.....**Blainvillea**

ACANTHOSPERMUM Schrank

Annual, erect herbs, stem hairy. Leaves opposite, toothed, palmately veined. Head solitary, axillary, sessile, radiate; involucral bracts few, outer ciliate along margin; inner few, globose, tough, papillose without, tubular, 2-horned at tip, enclosing female ray florets within; receptacle paleaceous; pales enclosing bisexual florets. Ligule 2-dentate. Anther obtuse below. Style arms longer in female florets. Achene compressed, glabrous; pappus 0.

Acanthospermum hispidum DC., Prodr. 5: 522. 1836; Gamble, Fl. Madras 704(495). 1921.

Herbs to 40 cm. Leaves 2-7.5×1.5-4.5 cm, ovate, acute, cuneate at base, hairy. Heads 2.5-3 cm across. Florets yellow.

Originally Brazilian. Common in plains in open country, often a troublesome weed in estates. May-September. *CJS* 13571, *HFP* 277.

ADENOON Dalzell

Annual herbs. Leaves alternate, short-petioled, palmately veined. Head solitary, usually terminal, pedunculate, discoid; involucral bracts multiseriate, elliptic, acute to acuminate; receptacle flat, fimbriate. Anthers sagittate below. Style arms hairy. Achenes cylindrical, 10-ribbed, glandular between ribs; pappus 0.

Adenoon indicum Dalzell, Hooker's J. Bot. Kew Gard. Misc. 2: 344. 1850; Gamble, Fl. Madras 668(470). 1921.

Herbs 60-65 cm tall; stem terete; glabrescent with age. Leaf blade broadly obovate, sometimes rounded, 2.5-4.5 × 1.5-3.5 cm, crenate-serrate, hairy. Head 1 cm across; bracts hairy. Florets purple. Achene glabrous.

Western Peninsular India. Common in upper Ghats, on exposed, grassy peaks. September-October. *CJS* 15262, 17837.

ADENOSTEMMA J. & G. Forster

Glabrous or hairy, annual herbs. Leaves opposite, sessile, crenate, palmately veined. Heads few-many, in terminal corymbs or panicles, discoid; peduncle bracteate; involucral bracts usually biseriate, oblong-elliptic to obovate, often glandular-hairy; receptacle glabrous. Corolla tube usually glandular-hairy. Anthers cordate below, truncate at apex. Style arms clavate, far-exserted. Achene longer than corolla tube; 3-angled, obovoid, oblong, glandular when young, sometimes tuberculate with age, tipped by 3-4, stalked, clavate, viscid, pappus knobs.

Adenostemma lavenia (L.) Kuntze, Rev. Gen. Pl. 1 : 304. 1891; Gamble, Fl. Madras 677(476). 1921. *Verbesina lavenia* L., Sp. Pl. 902. 1753. *Adenostemma latifolium* D. Don, Prodr. Fl. Nepal. 181. 1825; Wight, Ic. t. 1087. 1846.

Leaves 6-22 × 4-14 cm, broadly ovate, acute, cuneate below, glabrescent. Involucral bracts glandular-hairy. Corolla and style arms white. Achenes tuberculate; pappus knobs 3-4.

Asiatic, now Pantropical. Common in Ghats and western plains, usually in shaded moist places. October-January. *CJS* 15609.

Note: A. J. C. Grierson (*Ceylon J. Sci. Biol. Sci.* 10: 45-47. 1972) separates *Adenostemma lavenia* from *A. macrophyllum* (Bl.) DC. by its densely verrucose achenes and more or less glabrous leaves. *A. macrophyllum* has glabrous, smooth achenes and scabrous to pubescent leaves. *CJS* 11210, 15512, 15609, *HFP* 1041 approximate *A. macrophyllum* in that their achenes are sparsely, indistinctly verrucose. But the leaves do not show scabrate nature and the pubescence is variable.

AGERATUM Linnaeus

Glabrous or hairy, erect herbs or undershrubs, aromatic. Leaves opposite, those above sometimes alternate, petioled, crenate, palmately 3-nerved. Heads pedunculate, usually many, in corymbs or panicles, discoid; involucre campanulate; bracts 2-3-seriate, oblong-elliptic, acute, herbaceous; receptacle conical, naked. Corolla tube glandular, sometimes hairy. Anthers obtuse below, appendaged above. Style arms

slender, clavate. Achene oblong, 5-angled, glabrous, sometimes hairy along angles; pappus of 5 free, paleaceous scales, lacerate below, long-aristate.

Ageratum conyzoides L., Sp. Pl. 839. 1753; Gamble, Fl. Madras 677(476). 1921.

Leaves all opposite, petiole short, hairy; blade 2-9 × 1.5-6 cm, ovate, acute, crenate, palmately 3-nerved from base, glabrous or hairy. Heads in panicles; bracts acute at tip, sometimes glandular hairy. Corolla white or purple.

Originally Neotropical, now Pantropical. Common in plains and Ghats, thriving in wastelands, often a weed in estates. All seasons. *CJS* 15577, *HFP* 2103.

Note: Ageratum houstonianum Mill. with long acuminate involucral bracts, can be expected.

ANAPHALIS A. P. de Candolle

White cottony or woolly herbs, shrubs or small trees. Leaves alternate, indistinctly veined. Heads usually many and clustered, terminal or axillary, in corymbs or panicles, heterogamous, discoid; involucral bracts many-seriate; receptacle flat, glabrous. Outer florets few, female; disc florets many, mostly sterile. Corolla tubular, in female slender, dentate at tip, in bisexual floret 5-lobed. Anthers obtuse below. Style arms capitate. Achenes angled or not, sometimes compressed, glabrous or minutely glandular; pappus hairs many, deciduous.

Anaphalis lawii (J. Hooker) Gamble, Fl. Madras 695(489). 1921.

Anaphalis oblonga DC. var *lawii* J. Hooker, Fl. Brit. India 3: 283. 1881.

Stout herbs to 60 cm high. Leaves to 5.5 cm long, lanceolate, acute to acuminate. Heads clustered in corymbs; involucral bracts yellow.

Western Peninsular India. Common in Ghats, on roadcuts or open grassy hills. September-December. *CJS* 15923, *HFP* 2138.

ARTEMISIA Linnaeus

Usually aromatic, annual or perennial herbs, shrubs. Leaves alternate, sessile, entire, lobed to pinnatisect, pinnately veined. Heads usually small, solitary or fascicled, in racemes or panicles, heterogamous; involucral bracts 2-3-seriate, outer shorter, usually scarious along margin; receptacle flat or convex, usually glabrous. Corolla tubular; in female shortly 2-dentate at tip, in bisexual floret 5-lobed. Anthers usually sagittate below. Style arms truncate, fimbriate at tip. Achenes oblong, angled or not, sometimes striate, glabrous; pappus 0.

Artemisia nilagirica (C. B. Clarke) Pamp., Nuov. Giorn. Bot. Ital. 33: 452. 1926; Sant., Fl. Khandala ed. 3, 134. 1967. *Artemisia vulgaris* L. var. *nilagirica* C. B. Clarke, Comp. Ind. 162. 1876. *Artemisia indica* sensu Wight, Ic. t. 1112. 1846, non Willd. *Artemisia vulgaris* auct. non. L.: Gamble, Fl. Madras 713(502). 1921.

Undershrubs to 3 m tall, profusely branched. Leaves deeply lobed, cuneate at base, with a pair of stipule-like appendages; lobes entire. Florets white.

Western Peninsular India. Locally common along thickets by the road in middle Shiradi Ghat. October. *HFP* 1100.

BIDENS Linnaeus

Annual or perennial erect herbs. Leaves opposite, petiolate, usually imparipinnate. Heads pedunculate, in corymbs, panicles, sometimes solitary, usually radiate; involucral bracts many-seriate, outer narrower, inner broader and scarious-margined; receptacle paleaceous. Outer florets female, inner bisexual. Corolla in female ligulate, 2-3-dentate. Anthers obtuse at base. Style arms hairy. Achenes in outer florets laterally compressed; in disc flowers 3-4-angled, tipped by 2-4, retrorsely barbellate awns.

Bidens biternata (Lour.) Merrill & Sherff ex Sherff, Bot. Gaz. 88: 293. 1929; Backer & Bakh. f., Fl. Java 2: 413. 1965. *Coreopsis biternata* Lour., Fl. Cochinch. 508. 1790. *Bidens pilosa* auct. non L.: Gamble, Fl. Madras 709(499). 1921.

Annual erect herbs, to 1.5 m. Stem terete, grooved, hairy. Leaves 3-5-foliolate; leaflets 1.5-7.5 × 1.5-2 cm, ovate-lanceolate, acute to acuminate, narrowed below, dentate, hairy or glabrous. Bracts hairy along margin. Ray florets present or absent, white. Outer cypselae smaller, with or without apical hairs; inner longer, without hairs.

Asiatic. Common in Ghats, predominantly a weed. All seasons. *CJS* 14213, *HFP* 2062.

Note: *Bidens pilosa* L. and *B. bipinnata* L. may occur in the District. The former has white rays, a capitulum that is broader than long at maturity and all cypselae with tuberculate apical hairs. The latter has yellow rays, a capitulum that is longer than broad, smaller brown outer cypselae with hispid hairs and longer, black, generally glabrous, inner cypselae.

BLAINVILLEA Cassini

Annual herbs; stem scabrid hairy. Leaves opposite, alternate, petiolate, crenate, palmately veined, scabrid hairy. Heads usually solitary, axillary, terminal, sessile or peduncled; involucral bracts few, outer

herbaceous, hairy, the inner paleaceous; receptacle flat, with folded pales enclosing florets. Outer florets few, female; ligule 2-3-lobed. Anthers obtuse at base. Achenes in female florets trigonous, hairy, in bisexual florets, usually laterally compressed; pappus 0 or of 2-3 bristles or scales.

Blainvillea acmella (L.) Philipson, Blumea 6: 350. 1950. *Verbesina acmella* L., Sp. Pl. 901. 1753. *Eclipta latifolia* L. f., Suppl. Pl. 378. 1781. *Blainvillea latifolia* (L. f.) DC. in Wight, Contrib. Bot. Ind. 17. 1834. *Blainvillea rhomboidea* Cass., Dict. Sci. Nat. 29: 494. 1823; Gamble, Fl. Madras 706(496). 1921.

Herbs to 1.5 m. Stem terete, grooved. Leaves 3-6 × 1-4 cm, ovate, acute, serrate, hairy. Heads 0.6-0.7 cm across. Florets white, turning yellow with age.

Asiatic. Common in plains and upper Ghats, in open country especially in fallow fields and along roadsides. September-December. *CJS* 15139, *HFP* 2065.

BLUMEA A. P. de Candolle *nom. cons.*

Annual or perennial, erect or prostrate and ascending herbs, undershrubs or shrubs. Leaves alternate, crenate-serrate, sometimes lyrately lobed, pinnately veined, often aromatic. Heads radiate or discoid, 1-many, axillary and/or terminal, sessile or peduncled, usually in corymbose panicles, sometimes glomerulate; involucral bracts multiseriate, hairy or glandular, usually scarious margined; receptacle alveolate, tubercled, glabrous or pilose. Ray florets (marginal) female; corolla tubular, filiform, 2-4-lobed. Anthers usually tailed at the base; the connective produced, truncate, rounded or pointed at tip. Achenes smooth, angled or ribbed; pappus hairs 1-seriate, minutely dentate, often caducous.

1 Leaves densely white-woolly on the undersurface.
2 Head more than 0.8 cm across, arranged in pedunculate panicles; plant more than 150 cm tall..... *B. hieraciifolia*
2 Head less than 0.6 cm across, not panicled; plant less than 100 cm.
3 Prostrate herbs with a central rootstock and radiating and ascending branches.... ..... *B. oxyodonta*
3 Erect herbs.
4 Florets purple..... *B. mollis*
4 Florets yellow.
5 Heads in leafy clusters..... *B. belangeriana*
5 Heads not in leafy clusters..... *B. barbata*
1 Leaves glabrate, sometimes hairy, but not woolly nor white.
6 Petiole dilated and appendaged toward base..... *B. lanceolaria*
6 Petiole not dilated, not appendaged.
7 Leaves, at least those above, cordate and clasping stem..... *B. obliqua*
7 Leaves not cordate and clasping stem.

8 Heads few, in corymbs, not panicled. Leaves viscid.....*B. lacera*
8 Heads many, in lax pedunculate panicles. Leaves not viscid.
9 Stem with stalked glands.....*B. membranacea*
9 Stem without glands.....*B. virens*

Blumea barbata DC. in Wight, Contrib. Bot. Ind. 14. 1834; Gamble, Fl. Madras 687(483). 1921; Randeria, Blumea 10: 267. 1960.

Erect herbs reaching 60 cm in height; stem terete, red-brown, strigose-hairy, glabrous with age. Leaves sessile, 3-9 × 1.5-3 cm, obovate, serrate-dentate, with thick-based hairs above, velutinous and densely white-hairy beneath. Heads few-many, in corymbose panicles; head 0.6 cm across; receptacle glabrous. Florets yellow. Achene ribbed, hairy.

Peninsular India, Sri Lanka. Common in Ghats in full or partial shade especially along roads. October-December. *CJS* 11435, *HFP* 978.

Blumea belangeriana DC., Prodr. 5: 444. 1836; Gamble, Fl. Madras 686(482). 1921; Randeria, Blumea 10: 277. 1960.

Erect herbs reaching 60-70 cm; stem glabrous near base, densely silky above, brownish. Leaves sessile, 4-10 × 2-4.5 cm, obovate, rounded and acute at tip, dentate, with thick-based hairs above, white-woolly beneath. Heads in leafy clusters; head 0.6 cm across; receptacle alveolate, glabrous. Florets yellow. Achene ribbed, hairy.

Western Peninsular India. Fairly common in Shiradi Ghat, in shade on sandy terrain along river banks and roadcuts in semi-evergreen forests. December-February. *CJS* 15822, *HFP* 2646.

Blumea hieraciifolia (D. Don) DC. in Wight, Contrib. Bot. Ind. 15. 1834. *Erigeron hieraciifolium* D. Don, Prodr. Fl. Nepal. 272. 1825.

var. **macrostachya** (DC.) J. Hooker, Fl. Brit. India 3: 263. 1881; Gamble, Fl. Madras 687(483). 1921; Randeria, Blumea 10: 248. 1960. *Blumea macrostachya* DC., Prodr. 5: 442. 1836.

Large herbs or undershrubs to 3 m; stem branching above, grooved, pilose. Leaves 6-15 × 1.5-6 cm, obovate-elliptic, dentate, acute to rounded at tip, cuneate, densely hairy above, glabrous with age, white-woolly beneath. Heads in dense clusters at end of paniculate branches; head 1.4-1.8 cm across; receptacle alveolate, glabrous. Florets yellow. Achenes ribbed, hairy.

Indomalaysia. Fairly common in Shiradi Ghat, in partial or full shade. January-March. *CJS* 16348, *HFP* 2665.

Blumea lacera (N. Burman) DC. in Wight, Contrib. Bot. Ind. 14. 1834; Gamble, Fl. Madras 687(483). 1921; Randeria, Blumea 10: 264. 1960. *Conyza lacera* N. Burman, Fl. Ind. 180. 1768.

Erect aromatic, viscid herbs to 1 m; stem terete, grooved, with stalked glands; leaves petioled, 3-7 × 1-4 cm, obovate-oblong, sometimes rounded,

serrate, sometimes lyrately lobed, generally with few sharp teeth, with numerous glands and hairs on both surfaces. Heads in short panicles, 0.5-0.6 cm across; receptacle alveolate, glabrous. Florets yellow. Achene terete, slightly ribbed, sparsely hairy.

Paleotropics. Common in western plains and upper Ghats in exposed, moist places. September-January. *CJS* 13111, *HFP* 2588.

Blumea lanceolaria (Roxb.) Druce, Bot. Soc. Exch. Club Brit. Isles 4: 609. 1917. *Conyza lanceolaria* Roxb., Fl. Ind. 3: 432. 1832.

var. **spectabilis** (DC.) Randeria, Blumea 10: 220. 1960. *Blumea spectabilis* DC., Prodr. 5: 445. 1836; Gamble, Fl. Madras 688(484). 1921.

Large herbs or undershrubs to 2.5 m; stem terete, grooved, glabrous. Petiole dilated below, appendaged; leaf blade to 35 × 10 cm, oblanceolate, acute to rounded at tip, cuneate at base, serrate-dentate, glabrous. Heads pedunculate, in lax to dense panicles, 1 cm across; receptacle fimbriate. Florets yellow. Achene oblong, indistinctly ribbed, pubescent.

Indomalaysia. Common in Ghats, often near forest clearings. January-March. *CJS* 12588, 16282.

Blumea membranacea DC., Prodr. 5: 440. 1836; Gamble, Fl. Madras 687(483). 1921; Randeria, Blumea 10: 269. 1960.

Erect herbs to 50 cm; stem grooved, pilose, glabrous with age. Leaves short-petioled, ovate-lanceolate, sometimes lyrately lobed, dentate, pubescent, glabrous with age. Heads pedunculate, in panicles, to 1 cm across; receptacle alveolate, glabrous. Florets yellow. Achenes angled, hairy.

Indomalaysia. Common in Ghats, in shaded, moist places. December-March. *CJS* 15807, 15979.

Blumea mollis (D. Don) Merrill, Philipp. J. Sci. (Bot.) 5: 395. 1910; Randeria, Blumea 10: 261. 1960. *Erigeron molle* D. Don, Prodr. Fl. Nepal. 172. 1825. *Blumea wightiana* DC. in Wight, Contrib. Bot. Ind. 14. 1834; Gamble, Fl. Madras 686(483). 1921. *Blumea neilgherriensis* J. Hooker, Fl. Brit. India 3: 261. 1881; Gamble, Fl. Madras 686(484). 1921.

Herbs to 35 cm; stem grooved, hairy. Leaves sessile, shortly petioled, 3-8 × 2.5-3.5 cm, elliptic-oblong-obovate, rounded to acute at tip, cuneate, dentate-serrate, white-hairy beneath, usually aromatic. Heads in spiciform panicles, sometimes peduncled, 0.6-0.8 cm across; receptacle alveolate, glabrous. Florets purple. Achene angled, glabrous.

Paleotropics. Common in western plains and Ghats, both in the open and under cover. All seasons. *CJS* 15063, 16105.

Blumea obliqua (L.) Druce, Bot. Soc. Exch. Club Brit. Isles 4: 609.

1917; Randeria, Blumea 10: 286. 1960. *Erigeron obliquum* L., Mant. Alt. 573. 1771. *Blumea amplectens* DC. in Wight, Contrib. Bot. Ind. 13. 1834; Gamble, Fl. Madras 686(482). 1921.

Erect herbs to 30 cm; stem grooved, pilose, glabrous. Leaves sessile, 2-4.5 × 1-1.5 cm, elliptic, acute at tip, cordate and clasping stem at base, subcrenate, glabrous with age. Heads usually solitary, on long peduncles, 0.7 cm across; receptacle areolate, glabrous. Florets yellow. Achenes smooth, pubescent.

India, Sri Lanka. Occasional in Shiradi Ghat, in partially shaded, well-drained soil. December. *CJS* 15802, *HFP* 1212.

Blumea oxyodonta DC. in Wight, Contrib. Bot. Ind. 15. 1834; Gamble, Fl. Madras 686(482). 1921; Randeria, Blumea 10: 280. 1960.

Herbs with a central rootstock and radiating branches; stem hairy. Leaves sessile, to 5 × 2 cm, oblong-obovate, sharply dentate, white-hairy beneath. Heads peduncled, solitary or clustered, 0.5-0.6 cm; receptacle areolate, glabrous. Florets yellow. Achenes angled, pubescent.

South Asia. Common on open grassy slopes, pastures, on beaten tracks, roadsides in Ghats. January-April. *CJS* 16172, *HFP* 2738.

Blumea virens DC. in Wight, Contrib. Bot. Ind. 14. 1834; Gamble, Fl. Madras 687(483). 1921; Randeria, Blumea 10: 272. 1960.

Tall herbs to 2 cm; tips of stem and branches with stalked glands. Lower leaves oblanceolate, lyrately lobed, dentate, glandular beneath. Heads peduncled, in lax panicles, 0.8-1 cm across; receptacle areolate, glabrous. Florets yellow. Achenes ribbed, glabrous.

Indomalaysia. Fairly common along margins of wet deciduous and semi-evergreen forests in Ghats. December-January. *CJS* 16400, *HFP* 2636.

CENTIPEDA Loureiro

Annual, prostrate herbs. Leaves alternate, toothed; venation obscure. Heads solitary, usually axillary, sessile, peduncled, heterogamous, discoid; involucre globose; bracts biseriate, scarious-margined; receptacle flat, glabrous. Outer flowers female, many-seriate; inner bisexual, few. Corolla in female minute, 2-3-dentate. Stamens 4-5; anthers obtuse below. Style arms short, truncate. Achenes 3-4-angled, hairy on angles; pappus 0.

Centipeda minima (L.) A. Br. & Aschers, Ind. Sem. Hort. Berol. App. 6. 1867. *Artemisia minima* L., Sp. Pl. 849. 1753. *Centipeda orbicularis* Lour., Fl. Cochinch. 2: 493. 1790; Gamble, Fl. Madras 678(477). 1921.

Prostrate herbs with radiating branches; stem hairy. Leaves less than 0.8 cm long, obovate, spatulate, toothed. Florets white.

South Asia to Pacific Islands. Common in plains and Ghats, in harvested paddy fields or along river banks. April-July. *CJS* 16738, *HFP* 1682.

CENTRATHERUM Cassini

Annual herbs. Leaves alternate, serrate, pinnately veined. Heads axillary or terminal, solitary, few-many in corymbs, sometimes in sessile clusters, discoid; involucral bracts multiseriate, outer herbaceous, inner scarious; receptacle usually glabrous. Anthers obtusely auricled. Achenes ribbed, hairy or glabrous; pappus usually biseriate with the outer shorter and paleaceous, sometimes 0; inner dentate, deciduous.

1 Leaves white-woolly beneath.....*C. phyllolaenum*
1 Leaves green beneath, hairy.....*C. anthelminticum*

Centratherum anthelminticum (L.) Kuntze, Rev. Gen. Pl. 1: 320. 1891; Gamble, Fl. Madras 667(469). 1921. *Conyza anthelmintica* L., Sp. Pl. ed. 2, 1207. 1762.

Erect herbs to 1.5 m; stem terete, grooved, hairy. Leaves elliptic-lanceolate, serrate, acute to acuminate at tip, cuneate at base, sparsely hairy above, hairy beneath. Heads peduncled, solitary. Bracts hairy, oblong-elliptic, acute at tip. Corolla purple. Achenes ribbed, hairy; outer pappus short, paleaceous; inner denticulate.

Afghanistan to India. Occasional, in fallow fields near Belvathally State Forest, in the eastern plains. December. *CJS* 11970.

Centratherum phyllolaenum (DC.) Bentham ex J. Hooker, Fl. Brit. India 3: 228. 1881; Gamble, Fl. Madras 667(469). 1921. *Decaneuron phyllolaenum* DC., Prodr. 7: 264. 1838.

Annual herbs to 70 cm; stem terete, grooved, hairy. Leaves 5-9 × 1-2.2 cm, elliptic-lanceolate, acute to acuminate, cuneate at base, sparsely hairy above, densely white-woolly beneath. Bracts elliptic, oblong, acute, white-hairy, ciliate along margin; inner scarious. Corolla purple. Achenes ribbed, glabrous; pappus 1-seriate, denticulate, deciduous.

Peninsular to N. E. India. Common in Ghats, toward outskirts of forests and along roadsides. October-November. *CJS* 15412, 15496.

CHROMOLAENA A. P. de Candolle

Undershrubs, stem and branches glandular pubescent. Leaves opposite, subpalmately veined. Heads many, in terminal corymbs, peduncled, homogamous, discoid. Involucre more or less cylindrical;

bracts 1-many-seriate, outer usually shorter; receptacle flat to convex, glabrous. Anthers obtuse below. Style arms long-exserted. Achenes narrowly oblong, 5-angular, truncate. Pappus hairs 1-seriate, denticulate.

Chromolaena odorata (L.) King & Robinson, Phytologia 20: 204. 1970. *Eupatorium odoratum* L., Syst. Nat. ed. 10, 2: 1205. 1759; J. Hooker, Fl. Brit. India 3: 244. 1881; Hara, Fl. East. Himal. 339. 1966.

Leaves to 10×5 cm, ovate to rhomboidal, acute, crenate-serrate, subpalmately 3-nerved. Corolla white to purple.

Adventive Neotropical weed. A spreading weed in Ghats. November-April. *CJS* 12092, 15565.

CONYZA Lessing *nom. cons.*

Herbs or shrubs. Leaves alternate, crenate-serrate, pinnately veined. Heads axillary or terminal, usually many, peduncled, mostly corymbose, heterogamous, discoid; involucral bracts multi-seriate, linear-lanceolate; receptacle areolate, glabrous or hairy. Outer florets female, many; corolla tube filiform but not ligulate. Anthers entire below. Style arms in female much longer than in bisexual florets. Achenes usually laterally compressed, glabrous or minutely hairy or papillate; pappus hairs 1-2-seriate, denticulate, deciduous.

1 Leaves fastigiately arranged ..... *C. stricta*
1 Leaves not fastigiate.
2 Heads closely set in corymbs ..... *C. japonica*
2 Heads lax, in panicles.
3 Leaves lanceolate; those above subentire ..... *C. floribunda*
3 Leaves elliptic; those above serrate ..... *C. leucantha*

Conyza floribunda Kunth in Humb., Bonpl. & Kunth, Nov. Gen. Sp. 4: 73. 1820.

Large herbs reaching a meter high; stem paniculately branching above. Leaves at base large, lanceolate, acute to rounded at tip, narrowed below, subcrenate with bulbous-based hairs. Heads to 1 cm across. Corolla yellow. Achene compressed, hairy.

Originally Ecuador. Common in western plains and upper Ghats. September-January. *CJS* 13809, *HFP* 1200.

Conyza japonica (Thunb.) Less., Syn. Comp. 204. 1832; Gamble, Fl. Madras 683(480). 1921. *Erigeron japonicum* Thunb., Fl. Jap. 312. 1784.

Herbs to 75 cm. Leaves to 9×4 cm, rounded with a decurrent base;

blade crenate, hairy. Heads 0.7-0.9 cm across. Corolla yellow. Achenes marginate, hairy.

Afghanistan to Japan. Common in shade usually along roads in upper Ghats. *CJS* 13300, 15566.

Conyza leucantha (D. Don) Ludlow & Raven, Kew Bull. 17: 71. 1963. *Erigeron leucanthus* D. Don, Prodr. Fl. Nepal. 171. 1825. *Conyza viscidula* Wall. ex DC., Prodr. 5: 383. 1836; Gamble, Fl. Madras 683(480). 1921.

Herbs to 1 m; stem glabrous with age. Lower leaves large, elliptic, acute at tip, narrowed below, crenate-serrate. Heads 0.5 cm across, yellow. Achene compressed, glabrous.

Indomalaysia. Common in Ghats, at outskirts of semi-evergreen forests. September-January. *CJS* 15809, *HFP* 2637.

Conyza stricta Willd., Sp. Pl. 3: 1922. 1803; Gamble, Fl. Madras 683(480). 1921.

Herbs to 60 cm; stem densely hairy. Leaves fastigiate, 2-4×0.4-0.6 cm, spatulate, crenate, subentire hairy, narrowed below. Heads in panicles, less than 0.4 cm across, yellow. Achenes compressed, hairy.

Western Peninsular India. Common on mountain peaks in the District, on grassy slopes. September-October. *CJS* 15503, *HFP* 879.

COSMOS Cavanilles

Annual herbs. Leaves opposite, petiolate, lower 2-4-pinnatisect; upper ones less so. Heads usually solitary, peduncled, radiate; involucre campanulate; bracts many-seriate, the outer shorter; receptacle paleaceous. Outer florets female, few; the ligule 2-3-dentate. Anthers obtuse below. Style arms short in female florets, distinct, densely pilose hairy in bisexual. Achene fusiform, linear, furrowed, angled, passing into retrorsely barbellate awns.

Cosmos sulphureus Cav., Ic. 1: 56, t. 79. 1791; Gamble, Fl. Madras 710(499). 1921.

Tall herbs, to 80 cm high. Leaves 2-4-pinnatisect; lobes entire, glabrous, 7-8 cm long. Peduncle long. Ligules orange red to yellow, sometimes white; disc florets yellow.

Native of Tropical Americas. Grown in gardens, occurring as escape and naturalizing in plains and upper Ghats. September-October. *CJS* 15025, *HFP* 2294.

CRASSOCEPHALUM Moench

Herbs. Leaves alternate, crenate-serrate, pinnately veined. Heads

terminal, in corymbs, at first nodding, then erect; involucral bracts 1-2-seriate. pellucid-dotted, outer shorter; receptacle flat, naked, alveolate. Corolla tube long, gradually widening into short limb. Style arms long, truncate, papillose at top and tipped by a subulate appendage. Achenes ribbed; pappus hairs numerous, silky, denticulate, white, deciduous.

Crassocephalum crepidioides (Bentham) S. Moore, J. Bot. 1: 211. 1912; Backer & Bakh. f., Fl. Java 2: 426. 1965. *Gynura crepidioides* Bentham in W. J. Hooker, Niger Flora 438. 1849.

Slender erect herbs. Leaves 15×4 cm, elliptic-lanceolate, acute-acuminate, narrowed below, somewhat lobed, glabrous. Florets red.

Africa, now Pantropical. Common in plains and Ghats along roadsides, outskirts of forests and on sandy river beds. October-May. *CJS* 9608, 9938, 13141, 13636.

Note: We are grateful to Dr. Fosberg (U.S.) for identifying our specimens.

CYATHOCLINE Cassini

Aromatic, annual, glandular herbs. Leaves alternate, amplexicaul at base, pinnatisect. Heads few, peduncled, in corymbs, radiate; bracts biseriate, herbaceous. Outer florets many, filiform, female. The ligule 2-lobed; florets few. Anthers obtuse below. Style arms papillose. Achenes ovoid, glabrous; pappus 0.

Cyathocline purpurea (D. Don) Kuntze, Rev. Gen. Pl. 333. 1891. *Tanacetum purpureum* Ham. ex D. Don, Prodr. Fl. Nepal. 181. 1825. *Cyathocline lyrata* Cass., Ann. Sc. Nat. ser. 1, 17: 420. 1829; Wight, Ic. t. 1098. 1846; Gamble, Fl. Madras 679(478). 1921.

Herbs to 1.25 m high. Leaves glandular, viscid, to 15 cm long, pinnatisect; lobes dentate, acute. Corolla purple.

India to Burma. Common in western plains and upper Ghats. January-February. *CJS* 12195, *HFP* 2633.

DICHROCEPHALA A. P. de Candolle

Annual herbs. Leaves alternate, short-petioled, crenate, pinnately veined. Heads few-many, peduncled, discoid, heterogamous, in axillary or terminal, short panicles; bracts biseriate, slightly unequal; receptacle flat, raised, glabrous. Outer florets many-seriate, female; bisexual florets few, inner. Corolla tubular in both, in female 2-3-lobed, in bisexual 4-lobed. Anthers obtuse below. Style arms flat, short. Achenes obovoid, slightly compressed, glabrous; pappus of 4 short awns in bisexual florets, 0 in female.

Dichrocephala integrifolia (L. f.) Kuntze, Rev. Gen. Pl. 333. 1891; Hara, Fl. East. Himal. 338. 1966. *Hippia integrifolia* L. f., Suppl. Pl. 389. 1781. *Grangea latifolia* Lam., Tab. Encycl. t. 699, f. 1. 1796. *Dichrocephala latifolia* (Lam.) DC. in Wight, Contrib. Bot. Ind. 11. 1834; Wight, Ic. t. 1096. 1846; Gamble, Fl. Madras 678(477). 1921.

Annual herbs, rooting at nodes. Leaves 2-6 × 1-3 cm, variable in shape, lobed, crenate, sparsely hairy. Heads to 0.3 cm across. Outer florets pinkish, inner white.

Tropical Africa, Asia. Common in Ghats, along roadsides, sometimes a weed in estates. May-October. *CJS* 13649, *HFP* 1741.

DICOMA Cassini

Annual or perennial herbs or undershrubs. Leaves alternate, entire. Heads solitary, sessile, homogamous or heterogamous, discoid; involucral bracts many-seriate, outer shorter, inner ones longer, broader, scarious along margin, all ending in long, scabrid spines; receptacle flat, glabrous, pitted. Outer flowers sometimes female. Corolla tubular in both, in female 2-3-lobed. Anthers with a bearded tail at base. Style arms obtuse. Achenes 10-ribbed, densely silky-villous, tipped by many feathery pappus hairs; outer pappus hairs sometimes scaly.

Dicoma tomentosa Cass., Bull. Sci. Soc. Philom. Paris 12. 1818; Gamble, Fl. Madras 728(512). 1921. *Dicoma lanuginosa* DC. in Wight, Contrib. Bot. Ind. 26. 1834; Wight, Ic. t. 1140. 1846.

Woody perennials to 0.6 cm. Stem terete, white-hairy. Leaves alternate, 1-7 × 0.3-0.5 cm, oblong, lanceolate, white-woolly beneath, hairy above. Heads solitary, homogamous. Florets white.

Tropical Africa, India. Common in plains, on dry, gravelly terrain. August-February. *CJS* 15205, 16304.

ECHINOPS Linnaeus

Armed, woody annuals. Leaves alternate, amplexicaul at base, pinnatisect, spinous along margin, strongly 1-nerved. Heads densely bearded below, 1-flowered (discoid), collected into terminal compound heads; involucre oblong; bracts many-seriate, the outer shorter, the middle often spinous, the inner longer; receptacle minute. Anthers usually with a fimbriate tail. Style arms recurved, flat, glabrous. Achenes 5-angled, elongate, glabrous, tipped by short bristly, deciduous, free or connate pappus hairs.

Echinops echinatus Roxb., Fl. Ind. 3: 447. 1832; Gamble, Fl. Madras 724(509). 1921.

Woody herbs to 1 m. Leaves 7-15×2-6 cm (including spine tips) lanceolate, amplexicaul pinnatisect with crenations and lobes ending in sharp spines, white-woolly below. Head densely bearded. Floret white.

Afghanistan, India. Common in plains, in open country, along roadsides usually in dry sandy areas. February-March. *CJS* 16308, *HFP* 1420.

ECLIPTA Linnaeus *nom. cons.*

Annual or perennial herbs. Leaves opposite, sessile, subentire, with thick-based white hairs; venation indistinct. Heads solitary or paired, axillary, peduncled, radiate; involucre cupular; bracts biseriate with the outer larger; receptacle flat, paleaceous; pales enclosing bisexual florets. Outer florets many, female. Anthers obtuse below. Style arms longer in female. Achenes in female florets 3-angled, in bisexual 4-angled, oblong, narrowed below, truncate above, tipped by hairy rim, glabrous; pappus 0.

Eclipta alba (L.) Hassk., Pl. Jav. Rar. 528. 1848; Gamble, Fl. Madras 705(496). 1921. *Verbesina alba* L., Sp. Pl. 902. 1753. *Verbesina prostrata* L., Sp. Pl. 902. 1753. *Eclipta prostrata* (L.) L., Mant. Alt. 286. 1771; Sant., Fl. Khandala ed. 3, 133. 1967.

Creeping and ascending herbs; stem hairy. Leaves 1.5-4 cm×0.6-1 cm, linear-oblong, subentire, with thick-based white hairs. Flowers white.

Pantropical. Common in plains and Ghats, in open, wet situations. All seasons. *CJS* 1394, 2067.

Note: The last example of Article 57 (I. C. B. N. 1972) cites *Eclipta alba* as the name to use when united with *E. prostrata* since Hasskarl was the first author to unite these taxa (under *E. alba*).

ELEPHANTOPUS Linnaeus

Perennial herbs. Leaves radical, a few reduced and alternate above. Heads usually clustered at apices of branches, subtended by foliaceous bracts, few-flowered, homogamous, discoid; bracts rigid, imbricate, outer large and foliaceous; receptacle naked. Anthers shortly sagittate below. Style arms long, hairy. Achenes ribbed, cuneate below, sparsely hairy; pappus of rigid, basally dilated bristles.

Elephantopus scaber L., Sp. Pl. 814. 1753; Wight, Ic. t. 1086. 1846; Gamble, Fl. Madras 676(476). 1921.

Leaves 7-14×2.5-4.5 cm, oblanceolate, rigidly hairy. Florets purple.

Pantropical. Common in Ghats, under light cover. September-December. *CJS* 15568, *HFP* 2130.

EMILIA Cassini

Note: *Emilia* needs study. The taxa need redefinition, probably with greater emphasis on corolla lobe and anther length. Consideration should be given to the biological significance of the characters and their role in the evolution of taxa. The relationship of the older taxa, particularly *Emilia angustifolia, E. prenanthoidea, E. scabra* and *Gynura ecalyculata,* with recently described taxa needs review. The binomial *E. sonchifolia* is used here with confidence but other binomials are used tentatively.

Annual (perennial ?) herbs. Leaves alternate, entire to lyrately lobed. Heads solitary or few, corymbose, peduncled, discoid; involucre campanulate, uniseriate; receptacle naked. Anthers obtuse below, prolonged above. Style arms glabrous, appendages penicillate. Pappus abundant, capillary. Achenes narrowly oblong, with 5 open to almost closed internally puberulent grooves; outer achenes fertile and inner ones usually sterile.

1 Corolla lobes to 0.7 mm long (less than 1 mm).....*E. sonchifolia*
1 Corolla lobes over 1 mm long.
2 Corolla lobes ca. 1.5 mm long; anthers ca. 0.7 mm long. Plants small, densely branched, with short stems.....*E. alstonii*
2 Corolla lobes ca. 2 mm long; anthers ca. 1.2 mm long. Plants large, coarsely branched, with elongate stems.....*E. exserta*

Emilia alstonii Fosberg, Ceylon J. Sci. (Bio. Sci.) 10: 66. 1972.

Short stemmed with ascending inflorescences. Leaves crenate, to 4×2 cm; lower ones becoming pinnatifid with ovate terminal segment, the upper becoming lanceolate to bract-like. Involucre ca. 8×4 mm. Corolla purplish, exserted about one quarter its length; lobes 1.4-1.5 mm long. Anthers 0.6-0.8 mm long.

Sri Lanka, western Karnataka. Common weed in wet deciduous to evergreen forests. *CJS* 11657, 13393. One specimen (*CJS* 12800) is anomalous in that it has a different aspect and anthers 1.0 mm long. It may be intermediate with *E. exserta.*

Emilia exserta Fosb., Ceylon J. Sci. (Bio. Sci.) 10: 65. 1972.

Stems diffuse, coarsely branched. Leaves to 9×3.5 mm, shallowly crenate to dentate, the lower ones with a reniform terminal segment and narrow to broadly winged petiole (sometimes winged "petiole" is lyrate), upper leaves lanceolate with truncate to semiamplexicaul base. Involucre 6-7×5 mm. Corolla purple, exserted about one-third its length, lobes 2.0-2.3 mm long.

Sri Lanka, western Karnataka. Common in partial to full sun of semi-evergreen to wet deciduous forests. *CJS* 9782, 10107, *HFP* 1975, 2036, 2303 (intermediate with *E. alstonii* ?).

Note: It is possible that this material is varietally different from the Ceylon materials, at least there seems to be a stronger tendency for the basal leaves to have more reniform terminal segments. One collection (*HFP* 888) is much more dentate than others from both areas.

Emilia sonchifolia (L.) DC. ex Wight, Contrib. Bot. Ind. 24. 1834; Gamble, Fl. Madras 716(503). 1921. *Cacalia sonchifolia* L., Sp. Pl. 835. 1753.

Erect, glaucous (?) herbs. Leaves crenate, to 10×4 cm; well-developed lower leaves lyrate or with narrow base and triangular to orbicular terminal segment; upper leaves lanceolate, semiamplexicaul. Involucre 7-9×2-3 mm, equaling the florets. Corolla lobes 0.5-0.7 mm long.

Pantropical. Common in Ghats, often weed in estates and disturbed areas. *CJS* 9117. This apparently is the taxon mentioned by Adams (*Fl. Pl. Jamaica* 757. 1972) as diploid ($2n=10$) with cleistogamous flowers and obligately inbreeding.

EPALTES Cassini

Annual herbs; stem often winged. Leaves alternate, decurrent on stem, toothed, strongly 1-nerved. Heads solitary-many, corymbose, peduncled, heterogamous, discoid; involucre campanulate; bracts many-seriate, rigid, outer shorter; receptacle naked. Outer flowers female, many. Ligule 2-3 toothed. Corolla glandular without. Anthers usually tailed below. Style arms short, minutely papillose. Achenes oblong, ribbed in female, sometimes smooth, abortive in bisexual; pappus 0.

Epaltes divaricata (L.) Cass., Bull. Sci. Soc. Philom. Paris. 139. 1818; Gamble, Fl. Madras 691(486). 1921. *Ethulia divaricata* L., Mant. 110. 1767.

Diffuse herbs with trigonous stem, to 15 cm. Leaves 2-7×0.4-0.5 cm, oblong-spatulate, dentate, rounded, mucronate at tip. Involucral bracts ovate, acuminate, aristate. Florets purple.

Western Peninsular India, China, Burma. Occasional in eastern plains, on banks of a drying stream. Postmonsoon. *CJS* 15550.

ERIGERON Linnaeus

Annual herbs. Leaves alternate, pinnately veined. Heads 1-many, axillary or terminal, usually in panicles, peduncled, radiate; bracts 2-manyseriate, lanceolate, acute, scarious along margin, usually pubescent; receptacle flat, glabrous. Outer florets many, female. Anthers not tailed below. Style arms hairy. Achenes ellipsoid, usually angled, sparsely hairy; pappus hairs denticulate, 1-2-seriate.

Erigeron asteroides Roxb., Fl. Ind. 3: 432. 1832; Gamble, Fl. Madras 682(479). 1921.

Prostrate to ascending herbs; stem pilose. Leaves to 3×1 cm, obovate, crenate, hairy. Heads 1.2 cm across. Ray florets turning white from purple.

India. Common in fallow fields in western plains. April. *CJS* 9593, *HFP* 1435.

FLAVERIA A. Jussieu

Annual herbs. Leaves opposite, sessile, entire, sometimes dentate. Heads usually 1-flowered, mostly collected into dense cymes, subtended by floral leaves, discoid or radiate; involucre of 2-4 plicate bracts; receptacle naked. Anthers obtuse. Style arms slender, truncate. Achene ribbed, glabrous; pappus 0.

Flaveria australasica Hooker in T. Mitch., J. Trop. Austral. 118. 1838; Gamble, Fl. Madras 711(501). 1921.

Herbs to 50 cm; stem terete, grooved, glabrous. Leaves 2-5×0.5-1.5 cm, oblong, spatulate, sometimes obovate, subcrenate, palmately 3-ribbed. Florets yellow.

Australia. Common in plains in open country, in swampy soil amongst grasses. May-September. *CJS* 15364, *HFP* 1821.

GALINSOGA Ruiz & Pavon

Annual herbs. Leaves opposite, sessile, crenate, palmately veined. Heads usually solitary, peduncled, radiate; involucral bracts biseriate, scarious along margin; receptacle raised, paleaceous. Outer florets few, female with 3-dentate ligule. Anthers sagittate below. Style arms slender. Achenes angular; outer dorsally compressed, obovate, striate, usually black. Pappus of few scarious, fimbriate scales in disc florets, none in female.

Galinsoga parviflora Cav., Ic. 3: 41, t. 281. 1795; Gamble, Fl. Madras 711(500). 1921.

Slender herbs to 35 cm high. Leaves 2-7×1-3.5 cm, ovate, acute, sparsely hairy. Bracts scarious along margin. Florets white.

Originally Neotropics, now Pantropical. Common in open country, along roadsides, often a weed in cultivated fields. August-January. *CJS* 9245, *HFP* 1397.

GLOSSOCARDIA Cassini

Annual herbs. Leaves radical, pinnatisect; pinnules linear. Heads solitary, peduncled, radiate; involucre ovoid; bracts few, outer shorter,

inner oblong, scarious along margin; receptacle paleaceous. Ray florets few, female; ligule 2-dentate; bisexual florets with 4-lobed corolla. Anthers acute below. Style arms linear, papillose. Achenes laterally compressed, densely hairy along margin, tipped laterally by 2 smooth awns.

Glossocardia bosvallea (L. f.) DC. in Wight, Contrib. Bot. Ind. 19. 1834; Wight, Ic. t. 1110. 1846; Gamble, Fl. Madras 709(499). 1921. *Verbesina bosvallea* L. f., Suppl. 379. 1781.

Leaf segments filiform. Florets yellow.

India. Common in dry sandy terrain, in scrub forests in plains and along roadsides. June-September. *CJS* 14691, 15002.

GNAPHALIUM Linnaeus

White-woolly, annual herbs. Leaves alternate, indistinctly veined. Heads of few-many clusters, corymbose, spicate, radiate or discoid; involucre campanulate; bracts many-seriate; receptacle flat, glabrous. Outer florets female, numerous, ligule filiform, 2-3-fid; bisexual florets few. Anthers obtuse below. Style arms capitate. Achenes often angular, glabrous, sometimes glandular; pappus usually 1-seriate, deciduous.

1 Heads in leafy spikes; plant less than 15 cm tall.....*G. polycaulon*
1 Heads in corymbs; plant more than 20 cm tall.....*G. luteo-album*

Gnaphalium polycaulon Persoon, Syn. 2: 421. 1807; Grierson, Notes Roy. Bot. Gard. Edinburgh 31: 137. 1972. *Gnaphalium indicum* auct. non L.: Gamble, Fl. Madras 698(491). 1921.

Slender herbs, less than 15 cm tall. Leaves obovate, mucronate at tip. Heads in leafy terminal spikes, golden yellow in color. Achenes oblong, hairy.

Pantropical. Common in plains and upper Ghats. September-April. *CJS* 12859, *HFP* 1123.

Gnaphalium luteo-album L., Sp. Pl. 851. 1753; Gamble, Fl. Madras 698(491). 1921.

Erect, sometimes scandent herbs to 35 cm. Leaves to 8×1.5 cm, oblanceolate. Heads in peduncled corymbs, white to yellowish.

Pantropical. Common along roadsides in plains. October-January. *CJS* 15380, 16046.

GRANGEA Adanson

Annual, prostrate and ascending, sometimes erect herbs. Leaves alternate, sessile, pinnatifid. Heads usually solitary, axillary and

terminal, peduncled, globose, radiate; involucre campanulate; bracts 2-3-seriate, elliptic-oblong, ciliate along margin; receptacle naked. Outer florets female, 2-3-seriate; ligules filiform and 2-lobed; bisexual florets many; corolla 4-5-lobed. Stamens 4-5; anthers obtuse below. Style arms short, truncate in bisexual, elongate in female florets. Achenes compressed, glandular, turbinate, truncate at tip, tipped by a hairy tubular pappus.

Grangea maderaspatana (L.) Poir. in Lam., Encycl. Suppl. 2: 825. 1811; Wight, Ic. t. 1097. 1846; Gamble, Fl. Madras 680(478). 1921. *Artemisia maderaspatana* L., Sp. Pl. 849. 1753.

Leaves 2-7 cm long, pinnatifid, with opposite, rounded lobes, hairy. Florets yellow.

Asiatic, now Pantropical. Common in plains and Ghats, in open country in marshy ground, bunds of fields, in dry tank beds, sandy river beds. All seasons. *CJS* 15670, *HFP* 2063.

GUIZOTIA Cassini *nom. cons.*

Annual herbs. Leaves opposite, sessile, subentire, pinnately veined. Heads solitary, peduncled, radiate; involucral bracts biseriate, outer foliaceous, inner smaller, enclosing florets; receptacle raised, paleaceous. Corolla in female ray florets a 3-lobed ligule. Anthers shortly sagittate or entire at base, acute at tip. Style arms short. Achenes angled, compressed, glabrous; pappus 0.

Guizotia abyssinica (L. f.) Cass., Dict. Sci. Nat. 59: 248. 1829; Gamble, Fl. Madras 708(498). 1921. *Polymnia abyssinica* L. f., Suppl. 383. 1781.

Herbs to 1.5 m. Stem hairy upward. Leaves all opposite, to 14×4 cm, lanceolate, acute, cordate at base, subentire, sparsely hairy. Heads 2-2.5 cm across; outer bracts foliaceous, broadly ovate, acute, to 1.5×0.7 cm; inner oblong, obovoid. Ligules to 2×1 cm, bright yellow.

Native of Tropical Africa. Cultivated in the District mostly in Belur. The seeds yield an edible oil. *CJS* 10862, 14665.

GYNURA Cassini *nom. cons.*

Erect or creeping and ascending, sometimes climbing herbs. Leaves alternate, pinnately veined. Heads few-many, panicled, pedunculate, discoid; involucre campanulate; bracts 1-2-seriate, outer shorter; receptacle glabrous, alveolate. Anthers obtuse. Style arms long, subulate, hairy. Achenes ribbed, hairy between ribs; pappus hairs soft.

1 Plant tuberous; leave petiolate.....*G. lycopersicifolia*
1 Plant not tuberous; leaves sessile.....*G. nitida*

Gynura lycopersicifolia DC., Prodr. 6: 300. 1838; Gamble, Fl. Madras 714(502). 1921.

Slender herbs. Leaves broadly ovate, acute, narrowed into a short petiole, crenate, indistinctly lobed below, those above sessile, deeply pinnatifid. Heads 1.5-2 cm.

Western Peninsular India. Occasional in Bisle Ghat, in shade of shrubs or trees and on roadcuts. September-October. *HFP* 830, 2140.

Gynura nitida DC. in Wight, Contrib. Bot. Ind. 24. 1834; Wight, Ic. t. 1121. 1846; Gamble, Fl. Madras 714(502). 1921.

Stout herbs to 1.5 m high. Leaves 6-18×2-4 cm, lower ones entire, oblanceolate, upper cordate, amplexicaul at base, acute, crenate. Heads 1.5-2 cm. Florets yellow. Achenes ribbed, hairy between ribs.

Western Peninsular India. Common in Bisle Ghat, on roadcuts and outskirts of forests, usually in moist localities. September-October. *HFP* 971, 2163.

LAGASCEA Cavanilles *nom. cons.*

Annual herbs. Leaves generally opposite, petiolate, crenate, palmately veined. Heads 1-flowered, discoid, clustered into compound heads; involucre tubular; bracts 5, connate, pilose; receptacle small, glabrous. Anthers obtuse below. Achene cuneate, angled, sometimes dorsally compressed, glabrous, black: pappus a fimbriate rim.

Lagascea mollis Cav., Anal. Cienc. Nat. 6: 331, t. 44. 1803; Gamble, Fl. Madras 703(494). 1921.

Procumbent herbs; stem grooved, glabrous below. Petiole to 2.5 cm; leaf blade 1.5-5×1-2.5 cm, ovate, acute, grey-pubescent. Florets white.

An introduced Central American plant. Common weed in open country, in plains. May-September. *CJS* 13569, *HFP* 1825.

LAGGERA C. Schultz ex Oliver

Annual or perennial erect herbs; stem often winged. Leaves alternate, dentate, pinnately veined. Heads usually in short panicles or sometimes solitary, radiate; involucral bracts many-seriate, the outer short; receptacle glabrous. Outer florets female, many; disc florets fewer. Anthers not tailed. Style arms stigmatose. Achenes angled or ribbed, glabrous; pappus 1-seriate, caducous.

1 Stem not winged; leaves cordate and amplexicaul at base.....*L. flava*
1 Stem winged; leaves not amplexicaul at base.
2 Stem wings toothed.....*L. pterodonta*
2 Stem wings entire.....*L. alata*

Laggera alata (D. Don) C. Schultz ex Oliver, Trans. Linn. Soc. London 39: 94. 1873; Gamble, Fl. Madras 689(485). 1921. *Erigeron alatum* D. Don, Prodr. Fl. Nepal. 171. 1825.

Herbs to 90 cm high; stem broadly winged. Leaves sessile, to 6×2 cm, oblong-lanceolate, decurrent on to wing of stem, dentate, glandular. Heads in racemose panicles; peduncle and outer bracts of involucre glandular. Florets purple. Achenes ribbed.

Paleotropics. Locally common on top of Manjarabad Fort. December. *HFP* 1213.

Laggera flava (DC.) Bentham ex C. B. Clarke, Comp. Ind. 90. 1876; Gamble, Fl. Madras 689(485). 1921. *Blumea flava* DC., Prodr. 5: 439. 1836. *Blumeopsis flava* (DC.) Gagnep., Bull. Mus. Hist. Nat. Paris 26: 76. 1920.

Herbs to 40 cm; stem terete, grooved, glabrous. Leaves to 8×4 cm, obovate-oblong, cordate-sagittate and amplexicaul at base, serrate-dentate. Heads in panicles. Florets yellow. Achenes ribbed.

India, eastwards to Burma, including Sikkim, Bhutan. Occasional, collected once, from near Magge in dry deciduous forest. December. *CJS* 15876.

Laggera pterodonta (DC.) Bentham ex C. B. Clarke, Comp. Ind. 92. 1876; Gamble, Fl. Madras 689(485). 1921. *Blumea pterodonta* DC. in Wight, Contrib. Bot. Ind. 16. 1834; Wight, Ic. t. 1100. 1846.

Viscid herbs to 1.5 m; wing on stem toothed. Leaves to 10×4 cm, elliptic, acute at tip, decurrent on to stem wing, crenate. Heads few-solitary. Florets purple. Achene ribbed.

Tropical Africa, Burma. Fairly common, in upper Ghats along roadsides, and outskirts of wet deciduous forests. January-March. *CJS* 15965, 16541.

LAUNAEA Cassini

Laticiferous, annual herbs or perennials with short, subterranean stem. Leaves usually rosulate, sometimes cauline and alternate, entire, serrate-dentate, sometimes pinnatifid, pinnately veined. Heads few-many, in corymbs, pedunculate, ligulate; peduncle bracteate; involucral bracts multiseriate, the outer shorter; receptacle usually glabrous. Corolla a 5-dentate ligule. Anthers sagittate below, often with minute auricles. Style arms slender, papillose. Achene usually cylindrical and truncate at both ends, sometimes fusiform or oblong, ribbed, glabrous; pappus soft, 1-seriate, deciduous.

Launaea acaulis (Roxb.) Babc. ex Kerr in Craib, Fl. Siam. Enum. 2: 299. 1936. *Prenanthes acaulis* Roxb., Fl. Ind. 3: 403. 1832. *Lactuca glabra* DC. in Wight, Contrib. Bot. Ind. 26. 1834. *Microrhynchus glabra* (DC.) Wt., Ic. t. 1145. 1846. *Crepis acaulis* (Roxb.) J. Hooker, Fl. Brit. India 3: 396. 1881; Gamble, Fl. Madras 731(513). 1921.

Perennial with subterranean, short stem. Leaves rosulate, 2-6×1-2 cm, obovate, lanceolate, acute to rounded at tip, narrowed but amplexicaul at base, glaucous beneath, entire, distantly toothed to runcinate. Heads few-many, bracts 1-3-seriate, herbaceous, oblong-lanceolate. Corolla bright yellow, 1.8 cm long. Achenes cylindrical, truncate at both ends, ribbed, glabrous.

India to China. Common in plains and upper Ghats, in exposed places. January-May. *CJS* 12887, *HFP* 2600.

PARTHENIUM Linnaeus

Annual herbs. Leaves alternate, sessile, bipinnatifid. Heads many, peduncled, in panicles, radiate; involucral bracts biseriate; receptacle flat, paleaceous. Outer florets 5, female; inner few, male. Corolla in female an obovate, entire ligule; in male tubular, 5-lobed. Anthers obtuse below. Style arms slender. Achenes dorsally compressed, narrowed below; pappus of 2 lateral, reflexed awns.

Parthenium hysterophorus L., Sp. Pl. 988. 1753; Adams, Fl. Pl. Jamaica 751. 1972.

Herbs to 1.5 m. Leaves to 20×10 cm, pubescent; lobes entire, acute. Florets white. Ligule in female floret supported by 2 hyaline wings at base.

Tropical & Subtropical Americas. A recent introduction into the country, it is widely spreading. Locally common in and around Hassan town. August-September. *CJS* 10935, *HFP* 2107.

PULICARIA Gaertner

Annual or perennial herbs. Leaves alternate, serrate-dentate, usually amplexicaul below. Heads mostly solitary, peduncled, terminal, usually radiate, rarely discoid; involucral bracts 2-3-seriate, narrow; receptacle glabrous. Outer florets few, ligulate, female. Anthers shortly acute below. Achenes smooth, usually hairy; pappus biseriate, outer shorter, the inner elongate, dentate, deciduous.

Pulicaria wightiana (DC.) C. B. Clarke, Comp. Ind. 118. 1876; Gamble, Fl. Madras 702(493). 1921. *Poloa wightiana* DC., Arch. Bot. (Paris)

2: 514. 1833. *Callistephus wightianus* (DC.) DC., Prodr. 5: 275. 1836; Wight, Ic. t. 1089. 1846.

Annual herbs. Stem to 50 cm, hairy. Leaves 1.5-3×0.4-0.7 cm, oblong, rounded at tip, amplexicaul at base, serrate-dentate, hairy. Peduncle thickened toward tip, hairy. Bracts few, elliptic-obovate, hairy. Ray florets about 15; limb spatulate, 2-dentate, 1 cm long, bright yellow. Achenes hairy.

Central and Western Peninsular India. Common in plains, on exposed rocky to sandy soil. October-December. *HFP* 1076, 1115.

SENECIO Linnaeus

Annual or perennial herbs, shrubs, sometimes trees. Leaves alternate, crenate-serrate, sometimes incised and pinnatifid. Heads many, corymbose, paniculate, peduncled, radiate, rarely discoid; involucral bracts 1-2-seriate, outer shorter; receptacle usually alveolate, glabrous, sometimes fimbriate. Outer florets few, female, with 2-5-dentate ligule. Anthers occasionally minutely tailed. Style arms short in female. Achenes ribbed; pappus 1-seriate, deciduous, often absent in female, in bisexual denticulate.

1 Leaves divided.....*S. tenuifolius*
1 Leaves undivided.....*S. wightii*

Senecio tenuifolius N. Burman, Fl. Ind. t. 60, f. 4. 1768; Gamble, Fl. Madras 722(508). 1921. *Doronicum tenuifolium* (N. Burman) Wight, Ic. t. 1129. 1846.

Annual herbs, 30-40 cm tall. Leaves pinnatisect. Bracts scarious along margin. Ligule 0.4-0.2 cm, 2-3-dentate, bright yellow. Achenes ribbed, without pappus in female florets.

Central and Peninsular India. Common in scrub forests and hills across plains in open country. August-October. *CJS* 14700, *HFP* 462.

Senecio wightii (DC.) Bentham ex C. B. Clarke, Comp. Ind. 197. 1876; Gamble, Fl. Madras 722(507). 1921. *Doronicum wightii* DC. in Wight, Contrib. Bot. Ind. 23. 1834.

Annual herbs to 70 cm. Leaves 5-10×0.5-1 cm, ovate-lanceolate, acute at tip, amplexicaul at base, serrate-dentate. Heads rayed. Ligule to 0.5×0.3 cm, to 4-dentate, bright yellow. Achene ribbed, without pappus.

Western Peninsular India in the Ghats, Khasia mountains in the North. Common near rice fields and marshy areas. July-October. *CJS* 17942, *HFP* 878.

SIGESBECKIA Linnaeus

Annual herbs. Leaves opposite, crenate, palmately 3-nerved. Heads few-many, peduncled, in panicles, radiate; involucre campanulate-hemispheric; bracts biseriate, the outer cylindrical and clavate, glandular, the inner enclosing ray florets; receptacle paleaceous. Outer florets few, female; ligule 3-lobed. Anthers obtuse below. Style arms slender. Achene obovoid, curved, narrowed below, truncate, glandular; pappus 0.

Sigesbeckia orientalis L., Sp. Pl. 900. 1753; Wight, Ic. t. 1103. 1846; Gamble, Fl. Madras 704(495). 1921.

Viscid herbs. Leaves 4-8×1-4.5 cm, broadly ovate, acute, hairy, 3-ribbed. Corolla yellow.

Tropics. Fairly common, in western plains and Ghats, in open country. November. *CJS* 15644, 15679.

Note: Linnaeus spelt the generic name this way in his *Species Plantarum* (1753) and *Genera Plantarum* (1754).

SONCHUS Linnaeus

Annual or perennial, laticiferous herbs. Leaves cauline and rosulate, alternate; those above sessile and amplexicaul, serrate-dentate, sometimes deeply incised, pinnately veined. Heads ligulate, peduncled, collected into sparse panicles, corymbs or umbels; involucre of bracts campanulate, many-seriate, herbaceous; receptacle flat, glabrous. Corolla 5-dentate. Anthers sagittate below, sometimes with filiform basal auricles. Style arms slender, obtuse. Achenes oblong, narrowed at ends, ribbed, muricate, rugose; pappus 1-seriate, deciduous, silky.

1 Leaves deeply incised.....*S. oleraceus*
1 Leaves not incised.....*S. wightianus*

Sonchus oleraceus L., Sp. Pl. 794. 1753; Gamble, Fl. Madras 732(514). 1921. *Sonchus ciliatus* Lam., Fl. France 287. 1805; Wight, Ic. t. 1141. 1846.

Annual herbs to 90 cm; stem grooved, glabrous. Leaves 8-22×2-5 cm, obovate-oblanceolate, rounded-acute at tip, amplexicaul with auricles at base, sometimes runcinate, with long teeth, often deeply pinnately lobed, glaucous beneath. Heads few-many, in corymbs; bracts mostly glabrous. Ligulate corolla yellow, to 2 cm long. Achene ribbed, minutely muricate.

Temperate regions to Tropics. Common in plains, usually a weed in *Sorghum* fields. September-January. *CJS* 11963, *HFP* 1392.

Sonchus wightianus DC., Prodr. 7: 187. 1838; Wight, Ic. t. 1412. 1849. *Sonchus arvensis* auct. non L.: Gamble, Fl. Madras 732(515). 1921.

Herbs with creeping rootstock, to 1.25 m; stem terete, grooved, nearly glabrous. Leaves 10-30×2-5 cm, oblong-lanceolate, acute-rounded at tip, cordate and amplexicaul at base, runcinate, glaucous beneath. Heads in sparse panicles; bracts lanceolate, acute, outer shorter, glandular hairy. Ligulate corolla to 1.8 cm long, bright yellow. Achenes minutely muricate.

Temperate regions to Tropics. Common but widely scattered in plains and upper Ghats, along roadsides in moist, well-drained areas. August-May. *CJS* 16793, *HFP* 1479.

SPHAERANTHUS Linnaeus

Annual herbs; stem usually narrowly winged. Leaves alternate, decurrent onto the stem, toothed, pinnately veined. Heads discoid, clustered into compound heads, supported by a winged peduncle; involucre campanulate, bracts many; receptacle glabrous. Outer florets female; corolla tubular, 2-3-fid. Anthers obtuse. Style arms short. Achenes oblong, usually tipped by persistent corolla; pappus 0.

Sphaeranthus indicus L., Sp. Pl. 1314. 1753; Gamble, Fl. Madras 692(487). 1921. *Sphaeranthus hirtus* Willd., Sp. Pl. 3: 1395. 1802; Wight, Ic. t. 1094. 1846.

Prostrate or ascending, aromatic herbs, branching from near base; stem narrowly winged; wing toothed. Leaves to 4×1.5 cm, ovate, to obovate, acute to rounded at tip, sharply toothed. Compound heads globose, purplish; bracts lanceolate, acute, toothed along margin, membranous.

Africa to Australia. Common in open moist areas, in plains. January-April. *CJS* 12396.

SPILANTHES N. Jacquin

Annual herbs. Leaves opposite, petiolate, crenate, subentire, palmately veined. Heads discoid, sometimes radiate, peduncled, solitary, or collected into panicles, axillary and/or terminal; outer bracts herbaceous, usually fimbriate along margin, the inner carinate and enclosing florets; receptacle columnar, tapering. Ray florets if present, few, female, with 2-3-dentate ligule; bisexual corolla 4-5-fid. Stamens 4-5, nearly free. Anthers acute below. Style arms slender, hairy. Achenes dorsally compressed, sometimes trigonous, glabrous or hairy; pappus 0.

1 Heads solitary, terminal; achenes glabrous ..... *S. calva*
1 Heads collected into panicles, axillary and terminal; achenes hairy along margin ..... *S. paniculata*

Spilanthes calva DC. in Wight, Contrib. Bot. Ind. 19. 1834; Koster & Philipson, Blumea 6: 354. 1950; Grierson, Ceylon J. Sci. (Biol. Sci.) 10: 56. 1972. *Spilanthes acmella* auct. non (L.) Murr.: Gamble, Fl. Madras 708(498). 1921.

Creeping, ascending herbs. Leaves 2-3×1-2 cm, ovate, acute, subcrenate. Heads usually solitary, ovoid, to 1.1×0.7 cm. Bracts ovate, acute, sometimes elliptic, glabrous. Florets yellow. Achenes glabrous.

Indomalaysia. Common in Ghats, usually in shade along roadsides and outskirts of forests. September-December. The head is acidic in taste. *CJS* 15650, *HFP* 2175.

Note: This is closely allied to *S. iabadicensis* A. H. Moore which differs in having a pappose and ciliate achene and a radiate head.

Spilanthes paniculata Wall. ex DC., Prodr. 5: 625. 1836; Backer & Bakh. f., Fl. Java 2: 408. 1965.

Stout herbs. Leaves 6-14×3-6 cm, broadly ovate, acute, subentire. Heads in axillary and terminal panicles, to 1.2×0.7 cm. Bracts oblong-elliptic, fimbriate. Florets white. Achenes of the outer florets trigonous, thickened along margin and densely ciliate along these; those of inner florets dorsally compressed, ciliate along margin; both black, verrucose.

Indomalaysia. Common in Ghats and western plains. November-December. *HFP* 1199, 2458.

SYNEDRELLA Gaertner *nom. cons.*

Annual herbs. Leaves opposite, crenate, palmately veined. Heads few-many, sessile, axillary, radiate; involucre oblong, bracts few, outer foliaceous, the rest paleaceous; receptacle flat. Outer florets few, female; the ligule 2-4-dentate. Anthers in female florets dorsally compressed, with marginal stiff, lacerate wing, and 2 awns; in bisexual 2-3-angled, glabrous; pappus of 2-3 bristly awns.

Synedrella nodiflora (L.) Gaertner, Fruct. 2: 456. 1791; Gamble, Fl. Madras 708(498). 1921. *Verbesina nodiflora* L. in Juslenius, Cent. I. Pl. 28. 1755.

Herbs to 1 m. Stem terete, grooved, hairy. Petiole to 1 cm; leaf blade 4-12×1.5-3.5 cm, broadly ovate-elliptic, acute, sparsely hairy. Capitula less than 0.5 cm across. Florets yellow. Achenes black.

A native of Tropical America. Common in plains and Ghats. July-December. *CJS* 15605, *HFP* 2079.

TITHONIA Desfontaines ex Jussieu

Perennial herbs, undershrubs or shrubs. Leaves alternate usually

deeply lobed; lobes crenate, glandular. Heads solitary, with an apically thickened peduncle, radiate; bracts biseriate, thin, glabrous; receptacle paleaceous. Outer florets few, female, ligulate. Anthers obtuse at base. Style arms papillose hairy, recurved. Achenes oblong, dorsally compressed, hairy; pappus paleaceous, fimbriate.

Tithonia diversifolia (Hemsley) A. Gray, Proc. Amer. Acad. 19: 5. 1883; Sant., Fl. Khandala ed. 3, 139. 1967. *Mirasolia diversifolia* Hemsley, Biol. Contr. Amer. Bot. 2: 168. 1881.

Undershrubs to 2.5 m. Leaves to 20×14 cm, pubescent beneath, deeply divided into 3 acute lobes. Heads 10 cm across. Female florets 9-15; ligule to 9×1 cm, oblanceolate, 2-3-dentate at tip, bright yellow, thinly pubescent, glandular.

Americas. Common in gardens. Occurring as escape at foot of Manjarabad Fort and along hedges near Maranahalli. September-December. *CJS* 11462, 15562.

TRICHOLEPIS A. P. de Candolle

Annual or perennial herbs. Leaves alternate, sessile, toothed, punctate, pinnately veined. Heads usually solitary and terminal, discoid; involucre ovoid, bracts many-seriate, outer very narrow, inner slightly broader, all aristate-acuminate, often reflexed; receptacle bristly. Anthers tailed at base. Style arms short. Achenes oblong, truncate, smooth; pappus hairs many, denticulate.

Tricholepis radicans (Roxb.) DC., Prodr. 6: 584. 1838; Gamble, Fl. Madras 726(511). 1921. *Carduus radicans* Roxb., Fl. Ind. 3: 408. 1832.

Erect annual herbs, to 100 cm. Leaves at base obovate, and those above ovate to linear-lanceolate, crenate. Heads to 0.7 cm. Florets purple.

Western Peninsular India. Common in western plains and upper Ghats, on rocky ground, usually on mountain slopes. October-December. *CJS* 15758, *HFP* 1173.

TRIDAX Linnaeus

Annual or perennial herbs. Leaves opposite, short-petioled, palmately veined. Heads solitary, pedunculate, terminal, radiate; involucre campanulate; bracts 2-3-seriate, the outer herbaceous, inner scarious; receptacle convex, paleaceous. Outer florets few, female; ligule 2-3-dentate. Anthers shortly acute below. Style arms slender, hairy. Achenes turbinate, silky-villous; pappus bristles plumose.

Tridax procumbens L., Sp. Pl. 900. 1753; Gamble, Fl. Madras 711 (500). 1921.

Procumbent herbs, creeping and ascending. Petiole short, hairy; leaf blade 2.5-4 × 1.5-7.5 cm, ovate, acute, deeply incisodentate, sometimes 3-lobed; lobes acute; hairs thick-based. Heads to 1.2 cm; outer bracts ovate, acute, herbaceous, green, pubescent; inner scarious, pinkish above middle. Corolla yellow.

From S. America, now Pantropical. Common weed in open places. All seasons. *CJS* 9514, *HFP* 2586.

VERNONIA Schreber *nom. cons.*

Annual or perennial herbs, shrubs or trees. Leaves alternate, entire, crenate or serrate, often gland-dotted beneath, pinnately veined. Head discoid, few-many-flowered, in axillary or terminal, peduncled panicles; involucre many-seriate; outer bracts shorter, glandular, hairy or glabrous; receptacle glabrous. Florets bisexual, tubular. Corolla lobes campanulate, sometimes hairy, generally pink or purple. Anthers sagittate below. Style arms subulate. Achene angled or ribbed, hairy or glabrous; pappus usually biseriate, the inner longer, dentate and often caducous.

1 Trees..... *V. arborea*
1 Herbs or shrubs.
2 Achenes glabrescent; pappus uniseriate.
3 Achenes glandular between ribs; leaves white-woolly pubescent..... *V. indica*
3 Achenes eglandular; leaves not white-pubescent beneath.
4 Leaves scabrous above..... *V. divergens*
4 Leaves not scabrous above..... *V. dalzelliana*
2 Achenes densely hairy; pappus biseriate.
5 Plant silky..... *V. albicans*
5 Plant not silky.
6 Leaves appearing fascicled, ovate-lanceolate, crenate, those above entire..... *V. conyzoides*
6 Leaves single, ovate, acute to rounded, crenate, those above entire or not.. *V. cinerea*

Vernonia albicans DC. in Wight, Contrib. Bot. Ind. 6. 1834; Gamble, Fl. Madras 676(475). 1921.

White-silky herbs or undershrubs to 120 cm. Leaves 4-9 × 2-3.5 cm, ovate, cuneate at base, sinuately dentate. Bracts pilose, lanceolate, acute. Corolla purple. Achenes 2-3-angled, silky; pappus biseriate, outer very short, inner deciduous.

Western Peninsular India. Locally common at Nagpuri, in the hills in eastern plains, in scrub. July-September. *CJS* 15546, *HFP* 1951.

Vernonia arborea Ham., Trans. Linn. Soc. London 14: 218. 1824. *Monosis wightiana* DC. in Wight, Contrib. Bot. Ind. 1. 1834; Wight,

Ic. t. 1085. 1846. *Vernonia monosis* Bentham ex C. B. Clarke, Comp. Ind. 24. 1876, non Sch.-Bip., 1847; Gamble, Fl. Madras 672(473). 1921. *Vernonia arborea* var. *wightiana* J. Hooker, Fl. Brit. India 3: 239. 1881.

Trees to 7 m; twigs terete, pubescent. Petiole to 1 cm, pubescent; leaf blade to 15 × 8 cm, broadly elliptic, abruptly acute at both ends, hairy beneath, glabrous above. Heads in terminal panicles. Bracts acute. Florets few, purple. Achenes ribbed, sparsely hairy; pappus uniseriate.

Western Peninsular India. Few trees near Hanbal, on road to Mudigere. February. *CJS* 16277.

Vernonia cinerea (L.) Less., Linnaea 4: 291. 1829; Gamble, Fl. Madras 676(475). 1921. *Conyza cinerea* L., Sp. Pl. 862. 1753.

Annual herbs to 60-70 cm. Leaves 1-6 × 1-2 cm, ovate, acute, cuneate below, crenate, hairy. Bracts ovate-lanceolate, acute-acuminate, hairy, the outer shorter. Corolla pink; lobes ovate, acute. Achenes 2-3-angled, densely hairy; pappus biseriate, the outer short.

Paleotropics. A common weed in open country, roadsides, paddy fields, sometimes at outskirts of forests. May-December. *CJS* 13665, *HFP* 1094.

Vernonia conyzoides DC. in Wight, Contrib. Bot. Ind. 6. 1834; Gamble, Fl. Madras 676(475). 1921.

Annual herbs to 100 cm. Leaves appearing fascicled, 3-7 × 1-2 cm, ovate-lanceolate, acute, crenate-serrate, those above entire, thin, glabrescent. Bracts ovate-lanceolate, acute-acuminate, hairy, the outer shorter. Corolla purple. Achenes 2-3-angled, densely hairy; pappus biseriate, outer short.

Western Peninsular India. Fairly common in upper Bisle Ghat, in shade, in cardamom estates and outskirts of wet deciduous forests. November-February. *CJS* 15749, *HFP* 2629.

Vernonia dalzelliana Drumm. & Hutch., Bull. Misc. Inform. 261. 1909; Gamble, Fl. Madras 674(474). 1921.

Large herbs or undershrubs to 2.5 m; stem hairy. Petiole to 1 cm, hairy; leaf blade 10-17 × 5.5-9 cm, oblanceolate-obovate, acute, narrowed at base, thin, sparsely hairy beneath, glabrous above. Heads large, 1-1.5 cm across. Bracts elliptic, acute-mucronate, herbaceous, glabrous, outer shorter. Corolla purple; lobes ovate-lanceolate. Achene 10-ribbed, glabrous; pappus uniseriate, deciduous.

Western Ghats in Karnataka State. Common in shade of semi-evergreen forests in Ghats. November-December. *CJS* 15621, *HFP* 2309.

Vernonia divergens (Roxb.) Edgew., J. Asiat. Soc. Bengal 2: 172. 1853; Gamble, Fl. Madras 673(473). 1921. *Eupatorium divergens*

Roxb., Fl. Ind. 3: 414. 1832. *Decaneurum divergens* (Roxb.) DC., Prodr. 5: 68. 1836; Wight, Ic. t. 1084. 1846. *Vernonia nilgheryensis* DC., Prodr. 5: 32. 1836; Wight, Ic. t. 1076. 1846.

Tall herbs, sometimes undershrubs, occasionally straggling, to 2.5 m. Leaves short-petioled, 4-12 × 1.5-4 cm, elliptic, acute at both ends, subentire, scabrous above, hairy beneath. Bracts elliptic, acute, mucronate, glabrous. Corolla purple. Achenes 3-4-angled, minutely hairy; pappus 1-seriate.

Central & Peninsular India eastward to Burma. Common in Ghats. December-February. *CJS* 16113, *HFP* 1299.

Vernonia indica C. B. Clarke, Comp. Ind. 16. 1876; Gamble, Fl. Madras 674(474). 1921. *Decaneurum dendigulense* DC. in Wight, Contrib. Bot. Ind. 7. 1834 [non *Vernonia dendigulensis* DC.].

Herbs or undershrubs to 3 m; stem white-tomentose. Leaves short-petioled, 5-12 × 2-5 cm, elliptic, acute at both ends, crenate-serrate, densely white-woolly beneath, greenish above. Bracts ovate-elliptic, acute, mucronate, glabrous. Florets few, purple. Achene 10-ribbed, glandular between ribs; pappus uniseriate.

Western Peninsular India. Locally common at Bisle Ghat, in shade in semi-evergreen forest undergrowth, or on open grassy slopes near mountain peaks. November-December. *CJS* 15640, 15785.

VICOA Cassini

Annual or perennial herbs. Leaves alternate, usually entire, pinnately veined, mostly amplexicaul at base. Heads solitary, axillary or leaf-opposed, peduncled, usually radiate, rarely discoid; involucral bracts multi-seriate, narrow-acuminate; receptacle sometimes raised, glabrous. Outer florets few, female; the corolla ligulate, 2-dentate; the outer ligules broad, 2-3-dentate, the inner terete and subulate. Anthers sagittate below. Achenes angled, not ribbed, glabrous or hairy; pappus 1-seriate, smooth, scanty or none.

Vicoa indica (L.) DC. in Wight, Contrib. Bot. Ind. 10. 1834; Wight, Ic. t. 1148. 1846; Gamble, Fl. Madras 701(493). 1921. *Inula indica* L., Sp. Pl. ed. 2, 1236. 1762.

Suffrutescent herbs to 1 m; stem reddish-brown, terete, grooved, glabrous with age. Leaves to 8 × 1.2 cm, ovate-lanceolate, acute, cordate-hastate and amplexicaul below, entire, scabrid along margin, pubescent beneath. Heads 1.3-1.5 cm across, usually solitary on long peduncles; bracts lanceolate, acute, hairy, the outer shorter. Ray florets about 22; ligule to 0.5 × 0.2 cm, elliptic-oblong, 3-dentate, bright yellow. Disc

florets many, yellow. Achene glabrous in female, hairy in bisexual; pappus scanty in bisexual, none in female.

Central & Western Peninsular India, Sri Lanka. Common in plains and in wet deciduous forests. November-April. *CJS* 15791, *HFP* 1202.

XANTHIUM Linnaeus

Annual herbs. Leaves alternate, petiolate, lobed, crenate, palmately veined. Heads monoecious, discoid, with the functionally male heads in the upper axils, female heads in lower axils. Male head: bracts 1-seriate; receptacle, paleaceous; florets many, appearing bisexual but achenes sterile, enclosed within pales; style arms short, included. Female head globose, 2-florets; bracts all connate forming an indurate involucre which is tipped by 2 spinescent hooks and covered by hooked spines; corolla 0; style arms exserted. Achenes 2, enclosed within the hardened spinescent involucre; pappus 0.

Xanthium strumarium L., Sp. Pl. 987. 1753; Gamble, Fl. Madras 702(494). 1921. *Xanthium indicum* Koenig ex Roxb., Fl. Ind. 3: 601. 1832; Wight, Ic. t. 1104. 1846.

Erect herbs to 70 cm. Leaves broadly ovate, acute, 3-lobed, crenate, palmately veined, glandular. Involucre brown.

Tropics. Common near Hassan town, along roadside ditches. September. *CJS* 15121, *HFP* 2126.

129. ALISMATACEAE

C. J. Saldanha

Annual, rooted, aquatic or marsh, scapigerous herbs with short, erect, stems. Leaves alternate, basal; petioles sometimes sheathing at base, with spongy, longitudinal air chambers; blade glabrous, entire, floating or emergent, venation palmate, reticulate. Inflorescence a panicle, emergent, bracteate. Flowers unisexual or bisexual, regular. Sepals 3, greenish, persistent. Petals 3, white, longer than sepals, deciduous. Stamens 6 or many. Pistils 5-many, free, superior, each 1-locular; ovule solitary, basal. Fruit a ribbed, winged or laterally compressed achene, sometimes with 2 lateral chambers.

1 Pistils inserted on a large, globose receptacle; stamens many. Achenes laterally flattened.....**Sagittaria**

1 Pistils on a small receptacle; stamens 6. Achenes round in section.

2 Leaves sagittate. Flowers polygamous. Achenes with lateral air chambers.....**Limnophyton**

2 Leaves cordate. Flowers bisexual. Achenes without air chambers.....**Caldesia**

Fig. 105. ALISMATACEAE. *A. Caldesia parnassiifolia*: habit; *Aa*, flower; *Ab*, fruit.
B. Sagittaria sagitifolia: male flower; *Ba*, pistils on swollen receptacle.
C. Limnophyton obtusifolium: flower.

CALDESIA Parlatore

Leaves floating, deeply cordate, posterior lobes round. Branches of panicle in whorls of 3. Flowers bisexual. Stamens 6; filaments broadened at base. Pistils 5-8, crowded on a small receptacle; style subterminal. Achenes terete, longitudinally ridged on back, without any air chamber.

Caldesia parnassiifolia (L.) Parl., Fl. Ital. 3: 599. 1853; Hartog in Steenis, Fl. Malesiana ser. 1, 5: 319. 1957. ('*parnassifolia*') *Alisma parnassiifolia* Bassi ex L., Syst. Nat. ed. 12, 3 (App.): 230. 1768. ('*parnassifolia*'). *Alisma reniforme* D. Don, Prodr. Fl. Nepal. 22. 1825; Gamble, Fl. Madras 1594(1112). 1931. *Caldesia reniformis* (D. Don) Makino, Bot. Mag. (Tokyo) 20: 34. 1906.

Leaves broadly elliptic or suborbicular, rounded at apex, subcoriaceous, 13-15-veined. Flowers glabrous. Achenes awned with persistent style; ridges smooth.

Paleotropics to temperate areas. Common along margins of tanks on plains (Holenarsipur) and upper Bisle Ghat (Athihalli). March-May. *HFP* 110, 1431.

Note: Hutchinson (*Fam. Fl. Plants* 2: 544. 1960) characterizes *Caldesia* as having erect leaves. We have observed only floating leaves.

The orthography of the specific epithet has been corrected in accordance with Art. 73 (Note 2) and Rec. 73G(c). The epithet with *-ii-* indicates "leaves of *Parnassia*" while *-i-* indicates leaves of (Mt.) Parnassus."

LIMNOPHYTON Miquel

Leaves emergent, rounded at apex, sagittate; posterior lobes acute. Peduncle branched with many-flowered, remote whorls; bracts free. Flowers bisexual below and larger than upper, staminate flowers. Stamens 6. Pistils 15-many, on a small receptacle. Achenes with 2, lateral air chambers.

Limnophyton obtusifolium (L.) Miq., Fl. Ind. Bat. 3: 242. 1855; Gamble, Fl. Madras 1595(1113). 1931; Hartog in Steenis, Fl. Malesiana ser. 1, 5: 324. 1957. *Sagittaria obtusifolia* L., Sp. Pl. 993. 1753.

Flowers white. Achenes reticulate with excentric vestigial styles.

Paleotropics. Common in shallow tanks across plains. September-March. *CJS* 10596, *HFP* 1433.

Note: Hartog (*l.c.*) describes the leaves as floating. Emergent leaves in our plants are erect.

SAGITTARIA Linnaeus

Emergent leaves sagittate or lanceolate; floating leaves cordate; submerged leaves linear. Panicle with 1-3-flowered, remote whorls; bracts nearly connate. Lower flowers pistillate, rarely bisexual; upper staminate. Stamens numerous. Pistils numerous on large, rounded receptacle. Achenes compressed, with dorsal and ventral wings.

Sagittaria sagittifolia L., Sp. Pl. 993. 1753; Gamble, Fl. Madras 1596(1113). 1931.

ssp. **leucopetala** (Miq.) Hartog in Steenis, Fl. Malesiana ser. 1, 5: 332. 1957. *Sagittaria sinensis* Sims, Bot. Mag. 39: t. 1631. 1814; Gluck, Ann. Roy. Bot. Gard. (Calcutta) 150 Anniv. Vol. 59-90, pt. 1-23. 1942. *Sagittaria sagittifolia* var. *leucopetala* Miq., Ill. Fl. Arch. 2: 49. 1870.

Emergent leaves sagittate, acute at apex. Mature flowers with reflexed sepals. Staminal filaments glabrous.

Asian & Pacific Tropics. Collected only once in a large pond in upper Bisle Ghat (Athihalli). October. *CJS* 15290.

Notes: Gluck (*l.c.*) considered this taxon as a distinct species. However, Hartog considers the South Asian pure white-petaled plants as a subspecies of the temperate Old World *S. sagittifolia* which has a prominent purple spot at the base of the petals. Gamble (*l.c.*) reported *S. sagittifolia* as rare in Nilgiris at 7,800 ft. This is presumably the purple-clawed, temperate ssp. *sagittifolia*.

Sagittaria guayanensis H. B. K. ssp. *lappula* (D. Don) Bogin has appressed sepals on mature pistillate flowers.

130. HYDROCHARITACEAE

K. N. Gandhi & T. P. Ramamoorthy

Submerged, freshwater, sometimes dioecious herbs with fibrous roots. Leaves radical or cauline and whorled. Inflorescence with flowers usually solitary or clustered partly sunk in a spathaceous, normally 2-fid bract. Flowers regular, unisexual or bisexual. Perianth of 3 or 6 segments. Stamens 3-12, in 1-4 whorls. Ovary inferior, usually produced into a filiform beak or rostrum which bears the floral parts, 1-locular; ovules numerous, on 3-6 intrusive, parietal placentas; styles 3-12. Fruit linear or ovoid, dry or fleshy, partly enclosed in the normally persistent spathe; seeds few-many, smooth, tuberculate or echinate, apiculate or tailed at ends.

1 Leaves cauline, whorled.....**Hydrilla**

1 Leaves radical.

2 Leaves ovate-cordate. Spathe prominently winged.....**Ottelia**
2 Leaves linear. Spathe not winged.
3 Leaf margin minutely denticulate. Ovary not rostrate. Perianth of 3 petaloid sepals.....**Vallisneria**
3 Leaf margin entire. Ovary long-rostrate. Perianth in two whorls.....**Blyxa**

BLYXA Noronha ex Du Petit-Thouars

Acaulescent herbs. Leaves grass-like, membranous, usually entire, with a prominent central nerve, sheathing at base. Flowers solitary or clustered, bisexual or unisexual, on distinct scapes. Sepals 3, linear. Petals 3, white, longer than sepals. Stamens 3 to 9, free. Ovary with a rostrum; base included in the spathe; style short; stigmas 3. Fruits linear; seeds many, echinate, tailed or not.

1 Seeds conspicuously echinate, tailed at both ends.....*B. echinosperma*
1 Seeds obscurely echinate, not tailed.....*B. aubertii*

Blyxa aubertii L. Rich., Mem. Cl. Sci. Math. Inst. Natl. France 12(2): 77, t. 4. 1812; Hartog in Steenis, Fl. Malesiana ser. 1, 5: 390. t. 5. 1959. *Blyxa ceylanica* J. Hooker, Fl. Brit. India 5: 661. 1888; Gamble, Fl. Madras 1397(978). 1928.

Leaves 35×0.6 cm, 5-7-nerved. Flowers bisexual. Spathe tubular, 4-6- cm long. Petals 1.5 cm long. Staminal filaments filiform with linear anthers. Rostrum 5-8 cm long. Capsule cylindrical, to 6 cm long; seeds elliptic, obscurely tubercled, at best apiculate at tips, 1.5-2 mm long.

Madagascar, Indomalaysia. Fairly common in stagnant water and edges of tanks and paddy fields across upper Bisle Ghat and western plains (Arkalgud). October-March. *CJS* 11570-A *HFP* 2593.

Note: *B. octandra* (Roxb.) Planchon ex Thwaites can be expected. It has unisexual flowers, 9 stamens and seeds with 8 rows of spines.

Blyxa echinosperma (C. B. Clarke) J. Hooker, Fl. Brit. India 5: 661. 1888; Gamble, Fl. Madras 1397(978). 1928; Hartog in Steenis, Fl. Malesiana, ser. 1, 5: 391. 1959. *Hydrotrophus echinospermus* C. B. Clarke, J. Linn. Soc., Bot. 14: 8, t. 1. 1875. *Blyxa talbotii* J. Hooker, Fl. Brit. India 5: 661. 1888; Gamble, Fl. Madras 1397(978). 1928.

Flowers bisexual. Seeds with 8 rows of blunt spines and long filiform appendages at either end.

Indomalaysia. Collected once along with *Blyxa aubertii* in upper Ghats (Byakaravalli) on February 8, 1968. *CJS* 11570-B.

HYDRILLA L. Richard

Branched herbs with subterranean stem. Leaves cauline, whorled, sessile, serrulate, strongly veined in the centre. Spathe short, muricate.

Flowers minute, solitary, unisexual, with 3 ovate sepals and 3 oblong white petals. Staminate flowers axillary, short-pedicelled, with 3 stamens; anthers reniform; pistillode minute. Pistillate flower with ovary included in the spathe; rostrum present; styles 2-3; stigmas fimbriate. Fruits smooth or muricate; seeds 2-3, shortly apiculate at both ends.

Hydrilla verticillata (L. f.) Royle Ill. Bot. Himal. t. 376. 1839; Gamble, Fl. Madras 1396(977). 1928. *Serpicula verticillata* L. f., Suppl. 416. 1781.

Stem slender, green, often rooting at nodes; subterranean portion serving as means of vegetative propagation, often tuberous. Leaves 3-5 in a whorl, linear-oblong 1-5 cm × 0.2-1 cm.

Temperate & Tropical Old World. Common in large tanks across plains. November-February. *CJS* 9534, *HFP* 2565.

Note: Nechamandra alternifolium (Roxb.) Thwaites (including *Lagarosiphon alternifolia*) can be expected. It has alternate and longer leaves.

OTTELIA Persoon

Scapigerous herbs with submerged, narrow and floating broadly ovate leaves; venation palmate with cross veins. Scape angled. Spathes with 6 wavy-margined wings. Flowers solitary, bisexual. Sepals 3. Petals 3, white, with fleshy base. Stamens 6-12. Ovary included in the spathe, incompletely divided into 6 locules; styles linear, 3-6, 2-fid. Fruits fleshy, enclosed in spathe, 6-valved; seeds many.

Ottelia alismoides (L.) Pers., Syn. Pl. 1: 400. 1807; Gamble, Fl. Madras 1398(978). 1928; Hartog in Steenis, Fl. Malesiana ser. 1, 5: 398. 1957. *Stratiotes alismoides* L., Sp. Pl. 535. 1753.

Floating leaves broadly ovate-reniform, obtuse-cordate at base, 10 × 10 cm, 11-nerved; length of petiole varying with depth of water. Sepals 1.5 cm long. Petals 2-3 cm long. Stamens 6 (-9). Stigma fimbriate.

Paleotropics to Solomon Islands. Abundant along margins of large tanks and ditches across plains. September-March. *CJS* 13516, *HFP* 1414.

VALLISNERIA Linnaeus

Dioecious, submerged, rarely stoloniferous herbs. Leaves tufted at base, grass-like. Spathe 3-fid. Flowers unisexual with 3 petaloid sepals. Petals minute or 0. Staminate flowers clustered on a short peduncle; stamens 1-3; pistillode 0. Pistillate flowers free on long spirally coiled, filiform peduncles; staminodes 3, 2-fid. Ovary not rostrate covered by the spathe; styles 3; stigmas 3-lobed. Fruits linear; seeds many.

Vallisneria spiralis L., Sp. Pl. 1015. 1753; Gamble, Fl. Madras 1396(977). 1928.

Leaves oblong-lanceolate, obtuse or acute, faintly toothed at margin, 5-9-nerved. Peduncle of staminate flowers to 5 cm; of pistillate flower varying with the depth of water. Fruits 7 cm long, exserted from the spathe. Seeds cylindrical.

S. Asia through Malaysia. Growing at the bottom of tanks, pools, streams across plains. Pistillate plants common; staminate plants occasional. October-March. *CJS* 12310, *HFP* 1419, 2563.

Note: Hartog (in Steenis, *Fl. Malesiana* ser. 1, 5: 389. 1957) indicates that *V. gigantea* Graebner is in India and is distinguished from *V. spiralis* by having larger (over 1 cm broad), faintly dentate leaves with 5-9 nerves. He points out that the species differences are not satisfactory and need further study of living material.

131. APONOGETONACEAE

T. P. Ramamoorthy

APONOGETON Linnaeus f.

Submerged, acaulescent, tuberous, perennial herbs. Leaves subdimorphic, submerged, short-petioled, membranous and fugaceous; floating long-petioled, chartaceous; main veins striate, with numerous cross veinlets. Inflorescence an emergent, simple, long-peduncled spike. Flowers dense, regular, usually bisexual, ebracteolate. Tepals 1-3, usually 2, free, obovate. Stamens 6, free. Pistils 3, superior, each beaked, with 2-8 basal ovules. Fruit of 3 follicles; seeds oblong, smooth.

Aponogeton echinatus Roxb., Fl. Ind. 2: 210. 1832; van Bruggen, Blumea 18: 483, t. 7. 1970.

Tuber 4 cm thick. Leaves elliptic-lanceolate, acute-retuse, 11-25 × 2.5 cm. Peduncle 20-25 cm. Tepals white, persistent, less than 3 mm long. Ovules 2 per pistil (carpel). Fruits echinate.

S. India. Common in stagnant water and roadside pools of plains. June-December. *CJS* 15795, *HFP* 256.

Note: According to van Bruggen, *A. crispus* of authors, including Gamble, is *A. undulatus* Roxb., distinguished by having stolons, caducous tepals more than 5 mm long, and smooth fruits. Other species are reported for South India but probably do not occur in our area.

Fig. 106. APONOGETONACEAE. *A. Aponogeton echinatus*: plant; *Aa*, flower.

132. NAJADACEAE

K. N. Gandhi

NAJAS Linnaeus

Submerged, monoecious herbs. Leaves usually ternate, sometimes sessile, simple, serrulate, linear; base sheathing, 2-auriculate. Flowers

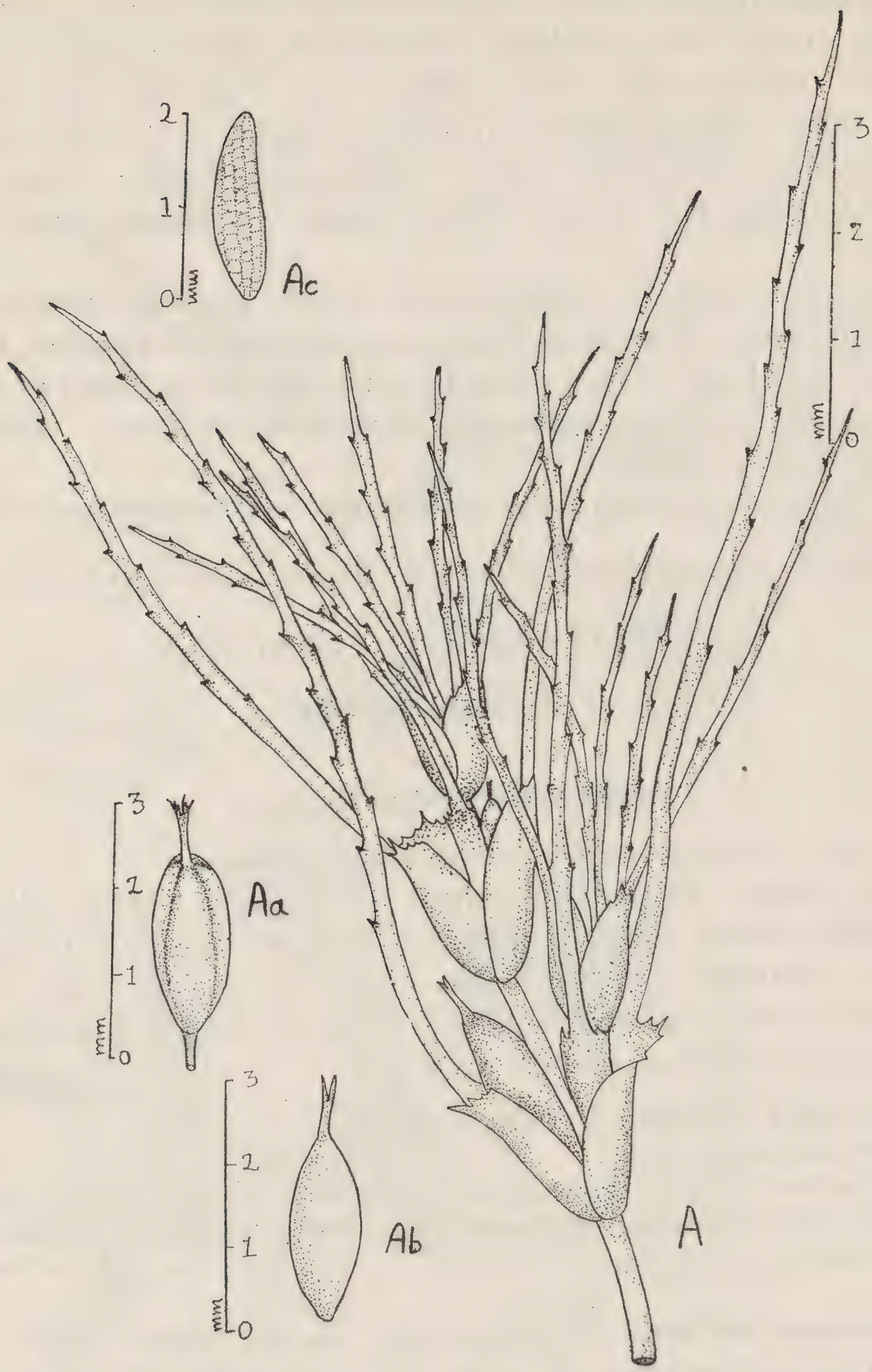


Fig. 107. NAJADACEAE. *A. Najas indica*: flowering twig; *Aa*, female flower; *Ab*, male flower; *Ac*, fruit.

usually solitary, sessile, axillary. Perianth 0 or tubular and hyaline (spathe). Staminate flowers with a single stamen surrounded by and adnate to spathe; anthers cuspidate, 1- or 4-celled. Pistillate flowers naked or in spathe; ovary superior; 1-locular with 1 basal ovule; style subulate, 2-fid. Fruit an achene; seeds areolate, loose. Monotypic family.

Najas indica (Willd.) Cham., Linnaea 4: 50. 1829; Gamble, Fl. Madras 1604 (1119). 1931; de Wilde in Steenis, Fl. Malesiana ser. 1, 6: 166. 1962. *Caulinia indica* Willd., Mem. Acad. Roy. Sci. Hist. (Berlin) 87. 1801. *Najas falciculata* A. Braun, J. Bot. 2: 278. 1864; Gamble, Fl. Madras 1604 (1119). 1931. *Najas lacerata* Rendle, Trans. Linn. Soc. London, Bot. 5: 416. 1899; Gamble, Fl. Madras 1604 (1119). 1931.

Stem delicate, smooth, rooting at lower nodes. Leaves to 3 cm; auricles of sheath toothed. Staminate flowers enclosed in 2.5 mm spathe; anthers 4-celled, 2 mm long. Fruits ellipsoid, attenuate, not enclosed in spathe.

Indomalaysia. Forming large masses in tanks across plains. December-April. *CJS* 9536, 12291-A.

Note: We include two South Indian species in synonymy following the synonymy of de Wilde (*l.c.*).

We can expect *N. graminea* (staminate flower not in spathe) and *N. minor* (anther 1-celled).

133. POTAMOGETONACEAE

T. P. Ramamoorthy

POTAMOGETON Linnaeus

Note: Mr. J. E. Dandy (BM) kindly reviewed the manuscript.

Aquatic herbs. Leaves submerged or floating, mostly alternate. Inflorescence spicate. Flowers regular, bisexual. Tepals 4, free, green, orbicular. Stamens 4, free, sessile. Pistils 4, superior, each with 1 pendulous ovule and a sessile stigma. Fruit of 4 subfree drupelets, each with a single reniform, smooth seed.

1 Upper (at least) leaves floating on surface, petiolate..... *P. nodosus*
1 All leaves submerged, sessile.
2 Leaves narrowly linear to filiform; sheath 1-2 cm long..... *P. pectinatus*
2 Leaves ovate to lanceolate, amplexicaul; sheath free, forming a membranous evanescent stipule..... *P. perfoliatus*

Potamogeton nodosus Poiret in Lam., Encycl. Suppl. 4: 535. 1816; Dandy in Rechinger, Fl. Iran. 83 (Potamogetonac.): 3. 1971. *Potamogeton indicus* Roxb., [Hort. Beng. 12. 1814, *nom.*] Fl. Ind. 1: 471. 1820, non Roth ex Roemer & Schultes, 1818; Gamble, Fl. Madras 1600 (1116). 1931; Sant., Fl. Khandala ed. 3, 293. 1967.

Stoloniferous. Leaves alternate, (uppermost opposite) elliptic-lanceolate, to 9×3 cm, chartaceous; submerged similar but undulate, longer, membranous; stipules to 5 cm. Spike to 5 cm. Drupelets obliquely obovoid, slightly beaked.

Widespread in warm temperate and tropical regions. Common in tanks of plains. July-November. *CJS* 15554, *HFP* 2592.

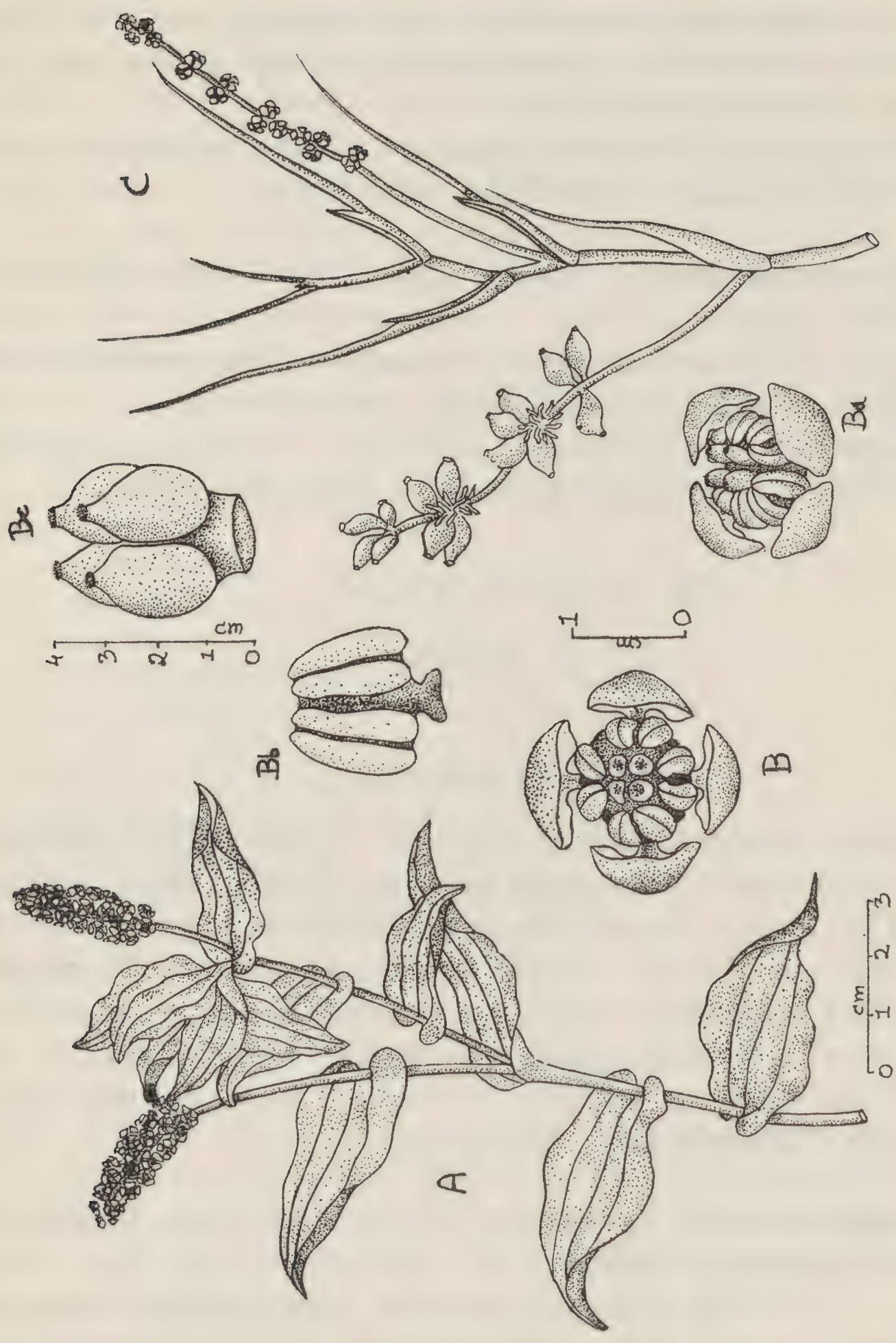


Fig. 108. POTAMOGETONACEAE. *A*. *Potamogeton perfoliatus*: flowering twig. *B*. *Potamogeton nodosus*: flower; *Ba*, same, lateral view; *Bb*, stamens; *Bc*, carpels. *C*. *Potamogeton pectinatus*: flowering and fruiting twig.

Note: *P. octandrus* Poiret (including *P. javanicus* Hassk.) differs from *P. nodosus* in having narrowly linear submerged leaves, the floating leaves smaller (1-4 cm long) with petiole shorter than blade.

Potamogeton pectinatus L., Sp. Pl. 127. 1753; Gamble, Fl. Madras 1600 (1116). 1931.

A profusely, distichously branched herb with narrowly linear to filiform leaves, sheathing at base (i.e., stipule adnate to leaf sheath, with free tips). Flowers in interrupted spikes.

Widespread in temperate and tropical regions. Common in tanks of eastern plains. March-November. *CJS* 17925, *HFP* 1413.

Potamogeton perfoliatus L., Sp. Pl. 126. 1753; Gamble, Fl. Madras 1600 (1116). 1931.

Stoloniferous. Leaves sessile, deeply cordate and amplexicaul at base, ovate-lanceolate, obtuse, to 3.75×1.75 cm, 7-more-nerved.

North temperate regions to Australia. Collected twice on plains (Halbagh and Yagachi River). November-February. *HFP* 1208, 2564.

134. XYRIDACEAE

K. N. Gandhi

XYRIS Linnaeus

Slender herbs with short, bulbous rootstock. Leaves radical, grass-like, sheathing. Inflorescence a bracteate head on a faintly ribbed peduncle. Flowers bisexual, sessile. Sepals 3, hyaline, deciduous, lateral two cymbiform, the inner one obovate. Petals 3, connate below in an elongate tube. Stamens 3, epipetalous with short, flattened filaments and sagittate anthers; staminodes 3, alternating with petals, bifid, fringed at tips, sometimes absent. Ovary superior, 1-3-locular; ovules parietal, many; style trifid with dilated stigma. Fruit a capsule.

Xyris pauciflora Willd., Phytogr. 1: 2, t. 1, f. 1. 1794; Gamble, Fl. Madras 1532 (1070). 1928.

Leaves to 15×0.2 cm, minutely papillose, pale reddish. Peduncles usually to 12 cm, rarely to 30 cm; bracts broadly oblong, yellowish brown at sides, brownish in the center, acute and green at apex. Sepals oblanceolate. Petals yellow, showy.

Indomalaysia. Common on marshy ground of upper Ghats and western plains (Bagi). July-November. *CJS* 15618, *HFP* 1377.

Note: *X. schoenoides* may be expected above 1,200 m. It differs from *X. pauciflora* in having acute, glabrous leaves and much longer (up to 50 cm) scapes.

135. COMMELINACEAE

K. N. Gandhi

Erect often subscandent herbs rooting at nodes, rarely epiphytic; roots fibrous, often tuberous; stem glabrous or pubescent, rarely cottony. Leaves alternate or radical, sessile or shortly petiolate; base sheathing with mouth of sheath ciliate; venation striate. Inflorescence a panicle or cyme, terminal and/or axillary, bracteate. Flowers bisexual, 3-merous or rarely 2-merous, usually irregular, bracteolate. Sepals 2-3, green, membranous. Petals 2-3, unequal, free or connate at base. Stamens 2, 3 or 6, often 1-3 reduced to staminodes; filaments adherent to petals or not, glabrous or with moniliform hairs; staminodes with cruciform, hastate, rarely polliniferous anthers. Ovary superior, 2-3-locular; ovules 1-many, axile; style 1; stigma 1, capitate or not. Fruit a loculicidal capsule or rarely indehiscent; seeds smooth or rugose, sometimes gland-dotted.

1 Plants epiphytic, creeping on tree trunks, viviparous at nodes.....**Belosynapsis**
1 Plants terrestrial.
2 Leaf sheaths inflated.....**Amischophacelus**
2 Leaf sheaths not inflated.
3 Inflorescence a cyme.
4 Floral bracts inconspicuous; staminodes present.....**Commelina**
4 Floral bracts large, imbricated; staminodes absent.....**Cyanotis**
3 Inflorescence a panicle or a cluster of 1-5 flowers.
5 Fertile stamens 6; inflorescence dense, many-flowered.....**Floscopa**
5 Fertile stamens 3; inflorescence lax or few-flowered.
6 Fruit indehiscent; flowers secund.....**Aclisia**
6 Fruit a dehiscent capsule; flowers not secund.
7 Flowers regular.....**Murdannia**
7 Flowers irregular.....**Aneilema**

ACLISIA E. Meyer

Stout, subscandent herbs to 1 m, with tuberous roots. Leaves large, elliptic-lanceolate, acuminate. Panicle terminal, lax, scorpioid with bracts leafy, oblong-lanceolate, acute or acuminate. Stamens 3 with staminal filaments glabrous; staminodes 3. Fruit subglobose, bright blue, indehiscent; seeds many, rugose.

Aclisia secundiflora (Blume) Bakh. f., in Backer & Bakh. f., Fl. Java 3: 658. 1968. *Commelina secundiflora* Blume, Enum. 1: 5. 1827. *Aclisia indica* Wight, Ic. t. 2068. 1853. *Pollia sorsogonensis* var. *indica* (Wight) C. B. Clarke in A. & C. DC., Monogr. Phan. 3: 127. 1881; Gamble, Fl. Madras 1533(1071). 1931. *Pollia secundiflora* (Blume) Bakh. f., Blumea 6: 399. 1950.

Leaves to 20×7 cm; lower short-petioled and sheathed; upper sessile and almost sheathless. Panicle to 20 cm. Flowers white.

India, Indomalaysia. Frequent in shade of middle to lower Shiradi Ghat. June-August. *CJS* 14631, *HFP* 1788.

Note: This species has been included under *Pollia* by several authors. R. C. Baskhuisen (*l.c.*) has once again segregated *Aclisia* from *Pollia.* The latter has actinomorphic flowers with 6 fertile stamens and the former zygomorphic flowers with 3 fertile stamens and 3 staminodes.

AMISCHOPHACELUS R. Rao & Kammathy

Subscandent, glabrous, branched herbs. Inflorescence a cyme, reduced to axillary fascicles, enclosed in inflated leaf sheaths. Bracteoles inconspicuous, transparent. Corolla tubular. Stamens 6 with hairy filaments. Capsule oblong, 3-beaked at apex.

1 Leaves linear-elongate, to 9×0.5 cm.....*A. axillaris*
1 Leaves oblong-lanceolate, to 3.5×0.8 cm.....*A. cucullata*

Amischophacelus axillaris (L.) R. Rao & Kammathy, J. Linn. Soc., Bot. 59: 306. 1966. *Commelina axillaris* L., Sp. Pl. 42. 1753. *Cyanotis axillaris* (L.) D. Don, Prod. Fl. Nepal. 46. 1825; Gamble, Fl. Madras 1550 (1082). 1931.

Slender branched herbs. Leaves linear-elongate, acute, 5-9×0.5 cm. Flowers purple. Seeds subcylindric, pitted.

Indomalaysia. Common in the wet paddy fields of plains (Hassan, Harihalli.) August-November. *HFP* 2093, 2174.

Amischophacelus cucullata (Roth) R. Rao & Kammathy, J. Linn. Soc., Bot. 59: 306. 1966. *Tradescantia cucullata* Roth, Nov. Pl. Sp. 189. 1821. *Cyanotis cucullata* (Roth) Kunth, Enum. 4: 107. 1843; Gamble, Fl. Madras 1550(1082). 1931.

Leaves oblong-lanceolate, obtuse; sheath prominently inflated. Flowers pale lilac. Capsule depressed at apex with 3 projections; seeds obscurely pitted.

South India. Locally frequent in open sandy places of plains (Arsikere). Fruiting in December. *CJS* 11935.

ANEILEMA R. Brown

Simple or branched herbs. Leaves alternate; base narrowed into a petiole. Inflorescence a terminal panicle with bracts leafy or funnel-shaped. Flowers irregular. Fertile stamens 2-3, with naked filaments; staminodes 2-3 or 0. Ovary 3-locular. Capsule dehiscent, subglobose; seeds 1-5 in each locule.

1 Leaves hispid above. Bracts funnel-shaped, persistent.....*A. scaberrimum*
1 Leaves glabrous. Bracts leafy, deciduous.
2 Panicle stalked, longer than the uppermost leaf.....*A. montanum*
2 Panicle subsessile, shorter than the uppermost leaf.....*A. ovalifolium*

Aneilema montanum (Wight) C. B. Clarke in A. & C. DC., Monogr. Phan. 3: 217. 1881; Gamble, Fl. Madras 1546(1079). 1931. *Tradescantia paniculata* Heyne ex Roth, Nov. Pl. Sp. 188. 1821, non Roxb., 1799. *Dictyospermum montanum* Wight, Ic. t. 2069. 1853.

Subscandent herbs. Leaves aggregate upwards, ovate to elliptic-lanceolate, acuminate, 8-14×3-5 cm, glabrous; sheath 2-3 cm long. Panicle very much longer than the uppermost leaf, with foliar bracts. Petals white. Stamens 3, staminodes 0. Fruiting pedicels erect with white capsules; seeds 1 in each locule, hemispherical, rugose.

N. E. & S. W. India. Common in lower to middle Shiradi Ghat (Kenchankumri State Forest). July-November. *CJS* 14433, *HFP* 2032.

Aneilema ovalifolium (Wight) J. Hooker ex C. B. Clarke in A. & C. DC., Monogr. Phan. 3: 218. 1881; Gamble, Fl. Madras 1546(1079). 1931. *Dictyospermum ovalifolium* Wight, Ic. t. 2070. 1853.

Panicle subsessile, shorter than the uppermost leaf. Fertile stamens 2; staminode 1. Fruiting pedicels recurved.

South W. India. Frequent in undergrowth, in Ghats (Kempuhole, Vanagur, Hettur). July-November. *CJS* 14172, 14579.

Aneilema scaberrimum (Blume) Kunth, Enum. 4: 69. 1843; Gamble, Fl. Madras 1546(1079). 1931. *Commelina scaberrima* Blume, Enum. 1: 4. 1827. *Dictyospermum protensum* Wight, Ic. t. 2071. 1853.

Herbs rooting at nodes. Leaves ovate-lanceolate, acuminate, 7-12× 3-4 cm, hispid above, glabrous below with hairy sheath to 2 cm. Panicle of umbelled racemes, minutely pubescent. Bracts funnel-shaped, persistent. Petals blue or white. Stamens 3, staminodes 2-3. Capsule hairy with 3 rugose seeds.

Indomalaysia. Frequent in partial shade, towards forest clearings in middle to upper Ghats (Kenchankumri, Maranahalli, Hettur). August-November. *CJS* 14608, *HFP* 1784.

BELOSYNAPSIS Hasskarl

Slender, stoloniferous, epiphytic. Leaves radical and cauline. Flowers solitary or in umbels, terminal and/or subterminal. Sepals free. Petals connate at the base. Stamens with naked filaments. Ovary 3-locular with filiform style. Capsule hairy.

Belosynapsis vivipara (Dalzell) Fischer ex Sprague & Fischer, Bull. Misc. Inform. 254. 1928; Gamble, Fl. Madras 1551(1082). 1931. *Cyanotis vivipara* Dalzell, Hooker's J. Bot. Kew Gard. Misc. 3: 226. 1851.

Stem viviparous (giving off shoots) at nodes. Some leaves radical and fleshy, pilose, sheathing, oblong-lanceolate, acute or acuminate, 5-11 × 0.5-1 cm; some cauline and ovate-acuminate, pubescent, to 3 × 0.5 cm. Sepals villous. Petals greenish-white. Seeds cylindrical, smooth, 2 in each locule.

South W. India. Common epiphytes on moss-covered tree trunks in Ghats. August-January. *CJS* 15324, *HFP* 1057.

COMMELINA Linnaeus

Erect or subscandent herbs sometimes with subterranean stem. Leaves subsessile. Inflorescence a cyme, terminal and/or axillary, arising from a spathiform bract, 2-branched, upper branch deciduous, lower fertile. Sepals often connate at base. Petals free, clawed, unequal, 2 larger. Stamens 3; filaments naked; anthers oblong, one usually larger; staminodes 2-3 or 0. Ovary 2-3-locular with erect style. Capsule hidden in the spathe; anterior locules 1-2-seeded; posterior locule when present, 1-seeded or empty.

1 Peduncle of spathe long, 2-5 cm; spathe folded in middle.....*C. diffusa*
1 Peduncle of spathe hardly 1 cm or none; spathe funnel-shaped.
2 Underground stem with bulb-like cleistogamous flowers; ovary 2-locular.....*C. benghalensis*
2 Underground stem without cleistogamous flowers; ovary 3-locular.
3 Plants robust. Leaves to 16 × 5 cm.....*C. paludosa*
3 Plants slender. Leaves to 10 × 1.5 cm.
4 Spathe recurved; plants perennial, in dry compacted soil.....*C. subulata*
4 Spathe erect; plants annual, in wet sandy soil.....*C. ensifolia*

Commelina benghalensis L., Sp. Pl. 41. 1753; Wight, Ic. t. 2065. 1853; Gamble, Fl. Madras 1539(1075). 1931.

Subscandent herbs with underground stem naked, ending in cleistogamous, white, fertile flowers. Leaves ovate, acute, often asymmetrical at base, 2-5 × 1.5-3 cm; sheath 1 cm long, with rufous hairs at mouth. Aerial flowers blue. Ovary 2-locular. Capsule 5-seeded.

Paleotropics. Weed in wet fields of plains. July-January. *CJS* 10184, *HFP* 1845.

Commelina diffusa N. Burman, Fl. Ind. 18, t. 7, f. 2. 1768; R. Rao, Notes Roy. Bot. Gard. Edinburgh 25: 179. 1964; Sant., Fl. Khandala ed. 3, 284. 1967. *Commelina nudiflora* auct. non. L.: Gamble, Fl. Madras 1538(1074). 1931.

Diffuse, succulent herbs. Leaves oblong-lanceolate, acute or acuminate, 7 × 2 cm with sheath 2-3 cm. Peduncle 2-5 cm long. Flowers blue. Ovary 3-locular. Seeds tuberculate.

Tropical India. Frequent in loose, sandy, moist soil, sometimes in rock crevices on plains. All seasons. *CJS* 13923, *HFP* 1935.

Commelina ensifolia R. Br., Prodr. 269. 1810; R. Rao, Blumea 14: 352. 1967. *Commelina undulata* var. *setosa* C. B. Clarke in A. & C. DC., Monogr. Phan. 3: 179. 1881; Gamble, Fl. Madras 1539(1075). 1931.

Rhizomatous, diffuse, slender herbs. Leaves lanceolate, acute or acuminate, 7-9 × 0.5-1 cm with sheath 2 cm. Flowers blue. Ovary 3-locular. Capsule 3-seeded.

N. Australia to India, Sri Lanka. Frequent in partial shade, in sandy terrain of plains. July-September. *CJS* 14114, *HFP* 1930.

Commelina paludosa Blume, Enum. 1: 2. 1827; R. Rao, Notes Roy. Bot. Gard. Edinburgh 25: 181. 1964. *Commelina obliqua* Ham. ex D. Don, Prod. Fl. Nepal. 45. 1825, non Vahl, 1805; Gamble, Fl. Madras 1539(1075). 1931. *Commelina polyspatha* Wight, Ic. t. 2066. 1853.

Stout subscandent herbs to 1 m. Leaves ovate to elliptic-lanceolate, acuminate, often oblique at base, 10-16 × 4 cm; sheath 2 cm with rufous hairs at mouth and margin. Flowers blue. Ovary 3-locular. Seeds smooth, 1 per locule.

Indomalaysia. Occasional in shade of middle to upper Shiradi Ghat (Maranahalli). August-December. *CJS* 14609, *HFP* 1352.

Commelina subulata Roth, Nov. Pl. Sp. 23. 1821; Gamble, Fl. Madras 1538(1074). 1931.

Slender herbs, branching from base. Leaves linear-lanceolate, acute, 10 × 0.5 cm. Flowers orange-colored. Ovary 3-locular. Capsule 3-5-seeded.

Tropical Africa, India. Common in open marshy soil of plains (Hassan). August-October. *CJS* 8975, *HFP* 2094.

CYANOTIS D. Don

Creeping, subscandent, rarely erect herbs, glabrous or villous, sometimes cottony; roots often tuberous. Cyme scorpioid, axillary and/or terminal, recurved, pedunculate with bracts leafy, equal or longer than the cyme, and bracteoles leafy, biseriate, falcate, imbricate, ovate, acute or acuminate. Flowers partly enclosed in the bracteoles. Sepals free or connate at the base. Petals connate at base. Stamens 6 with bearded

filaments. Ovary 3-locular, often hairy; style naked or pilose, sometimes flattened below the apex. Capsule enclosed in the bracteoles; seeds 1-2 per locule.

1 Plants cottony.
 2 Bulbous herb, growing on loose sandy soil.....*C. thwaitesii*
 2 Bulbs absent; growing on rocky surfaces.....*C. fasciculata*
1 Plants villous to glabrous.
 3 Roots tuberous; plant villous; bracts subtending inflorescence equaling inflorescence .....*C. tuberosa*
 3 Roots fibrous; plants glabrous; bracts subtending inflorescence more than twice inflorescence.....*C. cristata*

Cyanotis cristata (L.) D. Don, Prod. Fl. Nepal. 46. 1825; Wight, Ic. t. 2082. 1853; Gamble, Fl. Madras 1549(1081). 1931. *Commelina cristata* L., Sp. Pl. 42. 1753.

Glabrous herbs. Leaves ovate-oblong, acute, 3×1 cm. Peduncle 4-6 cm long with bract much longer than the cyme and bracteoles hairy at apex. Petals purple. Ovary hairy at apex; stigma capitate.

Paleotropics. Common on moist superficial soil of plains and upper Ghats. July-November. *CJS* 10964, *HFP* 2048.

Cyanotis fasciculata (Roth) J. & J. Schultes in Roemer & Schultes, Syst. 7(2): 1152. 1830; Wight, Ic. t. 2086. 1853; Gamble, Fl. Madras 1550(1082). 1931. *Tradescantia fasciculata* Heyne ex Roth, Nov. Pl. Sp. 189. 1821.

Cottony herbs, often pinkish in color, 8-12 cm. Leaves oblong-lanceolate, acute, 1-3×0.5 cm. Bracts slightly longer than the cyme. Sepals villous. Petals pinkish. Staminal filaments with bicolored, moniliform hairs. Capsule pilose upward.

S. India, Sri Lanka. Frequent on superficial rocky soil. August-November. *CJS* 15367, *HFP* 2200.

Cyanotis thwaitesii Hassk., Comm. Ind. 136. 1870. *Cyanotis arachnoidea* var. *thwaitesii* (Hassk.) C. B. Clarke in A. & C. DC., Monogr. Phan. 3: 254. 1881. *Cyanotis fasciculata* var. *thwaitesii* (Hassk.) J. Hooker, Fl. Brit. India 6: 388. 1892.

Bulbous, prostrate or erect, cottony herbs. Leaves lanceolate, acute, 2-8×0.5-1 cm. Flowers blue. Staminal filaments with bluish-purple moniliform hairs. Style hairy, inflated below the apex. Capsule hairy.

S. India. Frequent in dry sandy soil on plains and upper Ghats. July-October. *CJS* 8969, *HFP* 1938.

Cyanotis tuberosa (Roxb.) J. & J. Schultes in Roemer & Schultes, Syst. 7(2): 1153. 1830; Gamble, Fl. Madras 1549(1081). 1931. *Tradescantia tuberosa* Roxb., Pl. Cor. t. 108. 1798.

Densely villous or pubescent herbs with tuberous fasciculated roots and woody stem base, clothed with shining hairs. Leaves radical and cauline, oblong-lanceolate, acute, 8-25 × 1-3 cm, often pinkish-green; sheath 2 cm long. Cymes solitary or clustered; peduncle 3-10 cm long; bract equaling the cyme. Petals purple-blue; staminal filaments inflated at apex. Ovary hairy at apex.

South W. India. Common in sandy soil of plains. July-October. *CJS* 17963, *HFP* 2184.

FLOSCOPA Loureiro

Leaves alternate. Panicle clustered, terminal and subterminal with slender peduncle. Flowers secund, shortly pedicelled. Sepals oblong. Petals free, obovate. Stamens 6, with naked filaments. Ovary 2-locular; ovule 1-per locule. Capsule 2-seeded.

Floscopa scandens Lour. Fl. Cochinch. 193. 1790; Gamble, Fl. Madras 1552(1083). 1931. *Dithyrocarpus rothii* Wight, Ic. t. 208. 1839. *Dithyrocarpus petiolatus* Wight, Ic. t. 2079. 1853. *Dithyrocarpus undulatus* Wight, Ic. t. 2080. 1853.

Subscandent herb to 60 cm. Leaves elliptic-lanceolate, acuminate, 4-6 × 1-2 cm, with sheath 1 cm long. Flowers small, purple, crowded. Capsule ellipsoid; seeds rugose.

Indomalaysia. Occasional in marshes of middle to upper Ghats. October-January. *CJS* 12427, *HFP* 2461.

MURDANNIA Royle

Note: According to Royle as well as Brenan (1952), this genus is feminine, not neuter as treated by many authors.

Subscandent, leafy herbs with fibrous or tuberous roots. Leaves alternate, often radical. Inflorescence a panicle or a cluster of 1-6 flowers, axillary and/or terminal. Flowers regular. Stamens 3 with bearded or naked filaments; staminodes 1-3. Ovary 3-locular. Seeds 1-5 in each locule.

1 Roots tuberous.
2 Flowers 1-5, in clusters from upper leaf sheaths ..... *M. lanuginosa*
2 Flowers in terminal panicle.
3 Leaves mostly radical, less than 2 cm broad ..... *M. simplex*
3 Leaves cauline, 3-more cm broad ..... *M. elata*
1 Roots fibrous.
4 Leaves linear, 10 times longer than broad.
5 Plants tufted; leaves less than 0.2 cm broad; staminal filaments naked .... *M. semiteres*
5 Plants diffuse; leaves over 0.3 cm broad; staminal filaments bearded .... *M. nudiflora*
4 Leaves ovate-lanceolate, to 3 times longer than broad.

6 Fruiting pedicels recurved; flowers yellow.....*M. pauciflora*
6 Fruiting pedicels erect; flowers blue.....*M. spirata*

Murdannia elata (Vahl) Brueckner in Engl. & Prantl, Pflanzenfam. ed. 2, 15a: 173. 1930. *Commelina elata* Vahl, Enum. 2: 178. 1805. *Aneilema lineolatum* Kunth, Enum. 4: 69. 1843; Gamble, Fl. Madras 1544(1078). 1931. *Aneilema latifolium* Wight, Ic. t. 2072. 1853.

Stout herbs to 1 m, with erect, branching, leafy stem; root tubers slender. Leaves ovate-elliptic-lanceolate, acuminate, 15×5 cm, pale green, scarious at margin. Panicle terminal, dichotomously branched. Sepals brown. Petals white. Staminal filaments bearded. Capsule subglobose; seeds glandular.

Indomalaysia. Occasional in moist, sandy places covered with humus, in lower Shiradi Ghat (Kagenari, Kempuhole). June-September. *HFP* 335, 2873.

Murdannia lanuginosa (C. B. Clarke) Brueckner in Engl. & Prantl, Pflanzenfam. ed. 2, 15a: 173. 1930. *Aneilema lanuginosum* Wall. ex C. B. Clarke in A. & C. DC., Monogr. Phan. 3: 214. 1881; Gamble, Fl. Madras 1545(1079). 1931.

Slender herbs with subscandent or erect, leafy stem; roots tuberous. Leaves oblong-lanceolate, acute or acuminate, 4-6×0.5 cm, with sheath 1 cm long. Flowers 1-5, clustered, from upper leaf sheaths; pedicel jointed at the middle, with 2 minute bracteoles at the joint. Petals yellow, turning blue with age. Staminal filaments bearded in the lower half. Capsule oblong.

S. India. Frequent on partly exposed grassy slopes of Ghats (Vanagur, Maranahalli). July-October. *CJS* 14766, *HFP* 2135.

Murdannia nudiflora (L.) Brenan, Kew Bull. 7: 189. 1952; Backer & Bakh. f., Fl. Java. 3: 658. 1968. *Commelina nudiflora* L., Sp. Pl. 41. 1753, pro typ. parte. *Tradescantia malabarica* L., Sp. Pl. ed. 2, 412. 1762. *Aneilema nudiflorum* (L.) Wall., List. 182. No. 5224. 1830; Gamble, Fl. Madras 1545(1078). 1931; Merrill, J. Arnold Arbor. 18: 64-66. 1937. *Murdannia malabarica* (L.) Brueckner in Engl. & Prantl, Pflanzenfam. ed. 2, 15a: 173. 1930; Sant., Fl. Khandala ed. 3, 286. 1967.

Diffuse slender herbs with fibrous roots. Leaves linear-lanceolate, acute or acuminate, 5×0.5 cm; sheath 1 cm. Panicle terminal; rachis with obscurely raised scars. Flowers purplish. Staminal filaments bearded. Capsule globose; seeds 2 per locule.

Pantropical. Frequent on sandy or marshy soil of plains (Hassan) and upper Shiradi Ghat. August-October. *CJS* 15102, *HFP* 2271.

Note: Santapau (*Fl. Khandala* ed. 3, 286. 1967; *J. Bombay Nat. Hist. Soc.* 52: 658. 1955) does not agree with the above typification and calls this taxon *M. malabarica.*

Murdannia pauciflora (Wight) Brueckner in Engl. & Prantl, Pflanzenfam. ed. 2, 15a: 173. 1930. *Aneilema pauciflorum* Wight, Ic. t. 2077. 1853 ('*pauciflora*'), nom. illegit. non Dalzell (Hooker's J. Bot. Kew Gard. Misc. 3: 136. 1851=*M. vaginata* (L.) Brueckner); Gamble, Fl. Madras 1545 (1078). 1931. *Murdannia wightii* Rolla Rao & Kammathy, Notes Roy. Bot. Gard. Edinburgh 25: 184. 1964, nom. superfl.

Tufted, subscandent herbs with fibrous roots. Leaves ovate-acute, cordate at base, 2×1 cm; sheath 0.5 cm. Inflorescence of 1-5 flowers, axillary and terminal. Petals yellow. Staminal filaments glabrous. Fruiting pedicels recurved; seeds many per locule.

S. India, Malaya. Occasional on wet soil and marshes of upper Shiradi Ghat (Yettinahalla). July-November. *HFP* 2053, 2459.

Note: Nomenclature follows from application of Art. 72, Note of ICBN.

Murdannia semiteres (Dalzell) Sant., Poona Agri. Coll. Mag. 41(4): 284. 1951; Brenan, Kew Bull. 7: 184. 1952. *Aneilema semiteres* Dalzell, Hooker's J. Bot. Kew Gard. Misc. 3: 138. 1851. *Aneilema paniculatum* Wall. ex C. B. Clarke in A. & C. DC., Mongr. Phan. 3: 215. 1881, non Wight, 1853; Gamble, Fl. Madras 1546(1079). 1931. *Dichaespermum juncoides* Wight, Ic. t. 2078. 1853.

Tufted, erect, slender herbs to 12 cm. Leaves linear-elongate, acute or acuminate, 4-10×0.1-0.3 cm. Panicle terminal, slender. Flowers blue. Staminal filaments naked, connate at base. Capsule subglobose.

Africa, S. India. Occasional on wet, superficial soil of plains (Hassan) and upper Bisle Ghat (Vanagur). August-October. *CJS* 17832, *HFP* 2137.

Murdannia simplex (Vahl) Brenan, Kew Bull. 7: 186. 1952. *Commelina simplex* Vahl, Enum. 2: 177. 1805. *Aneilema sinicum* Lindley, Bot. Reg. t. 659. 1822; Gamble, Fl. Madras 1545 (1078). 1931. *Aneilema secundum* Wight, Ic. t. 2075. 1853.

Subscandent herbs with slender tuberous roots. Leaves radical and cauline, linear-lanceolate, acute. Panicle terminal; rachis with prominently raised scars. Petals purple. Fertile stamens 2, rudimentary stamen 1; filaments bearded. Capsule oblong; seeds rugose.

Paleotropics. Common in moist, sandy soil of western plains and Bisle Ghat. July-October. *CJS* 14670, *HFP* 1863.

Murdannia spirata (L.) Brueckner in Engl. & Prantl, Pflanzenfam. ed. 2, 15a: 173. 1930. *Commelina spirata* L., Mant. Alt. 176. 1771. *Aneilema spiratum* (L.) R. Brown, Prodr. 271. 1810; Gamble, Fl. Madras 1545(1078). 1931.

Branched, dwarf herbs with fibrous roots. Leaves ovate-oblong, cordate and semi-amplexicaul at base, 1-2×0.7 cm. Panicle short, slender. Flowers blue. Staminal filaments bearded. Capsule bearded.

Indomalaysia. Occasional in wet places of plains (Hassan) and upper Shiradi Ghat (Maranahalli). August-November. *CJS* 11260, *HFP* 2191.

136. ERIOCAULACEAE

K. N. Gandhi

Note: Dr. H. N. Moldenke has been kind enough to help us with the determinations.

ERIOCAULON Linnaeus

Annual or perennial, monoecious or dioecious, marsh or aquatic plants with stem usually short. Leaves simple, grass-like. Inflorescence capitate, subtended by involucral bracts, on spirally ribbed peduncles; receptacle hairy or glabrous. Flowers unisexual, usually regular, bracteate. Perianth 2-3-merous, chaffy to hyaline, 2-whorled; petals often with black gland below the apex. Staminate florets: sepals free or connate; petals connate; stamens 6, free, biseriate. Pistillate florets: sepals and petals free. Ovary superior, 2-3-locular with 1 pendulous ovule per locule; style 2-3-fid. Fruit a loculicidal capsule.

1 Stem elongate; aquatic plants.....*E. setaceum*
1 Stem short or none; marsh plants.
2 Leaves red to pinkish (fresh or dry).....*E. quinquangulare*
2 Leaves green.
3 Plants more than 25 cm long; involucral bracts hairy.
4 Petals in male floret unequal, one longer than floral bracts.....*E. polycephalum*
4 Petals in male floret equal, shorter than floral bracts.
5 Petals in female floret with a gland.....*E. robusto-brownianum*
5 Petals in female floret eglandular.....*E. nilagirense*
3 Plants under 25 cm long; involucral bracts glabrous.
6 Leaves capillary.....*E. cinereum*
6 Leaves more than 3 mm broad.
7 Floral bracts glabrous.....*E. hookerianum*
7 Floral bracts hairy in the upper half or at apex.
8 Sepals in female floret 2.....*E. truncatum*
8 Sepals in female floret 3.
9 One sepal in female floret much narrower.
10 Petals in female floret with a gland.....*E. heterolepis*
10 Petals in female floret eglandular.....*E. dianae*
9 Sepals in female floret subequal.
11 Petals with a gland.....*E. infirmum*
11 Petals eglandular, sometimes absent in female floret.....*E. eleanorae*

Eriocaulon cinereum R. Br., Prodr. 254. 1810; Sant., Fl. Khandala ed. 3, 294. 1967. *Eriocaulon sieboldianum* Sieb. & Zucc. ex Steudel, Syn. Pl. Glum. 2: 272. 1855; Gamble, Fl. Madras 1619(1127). 1931.

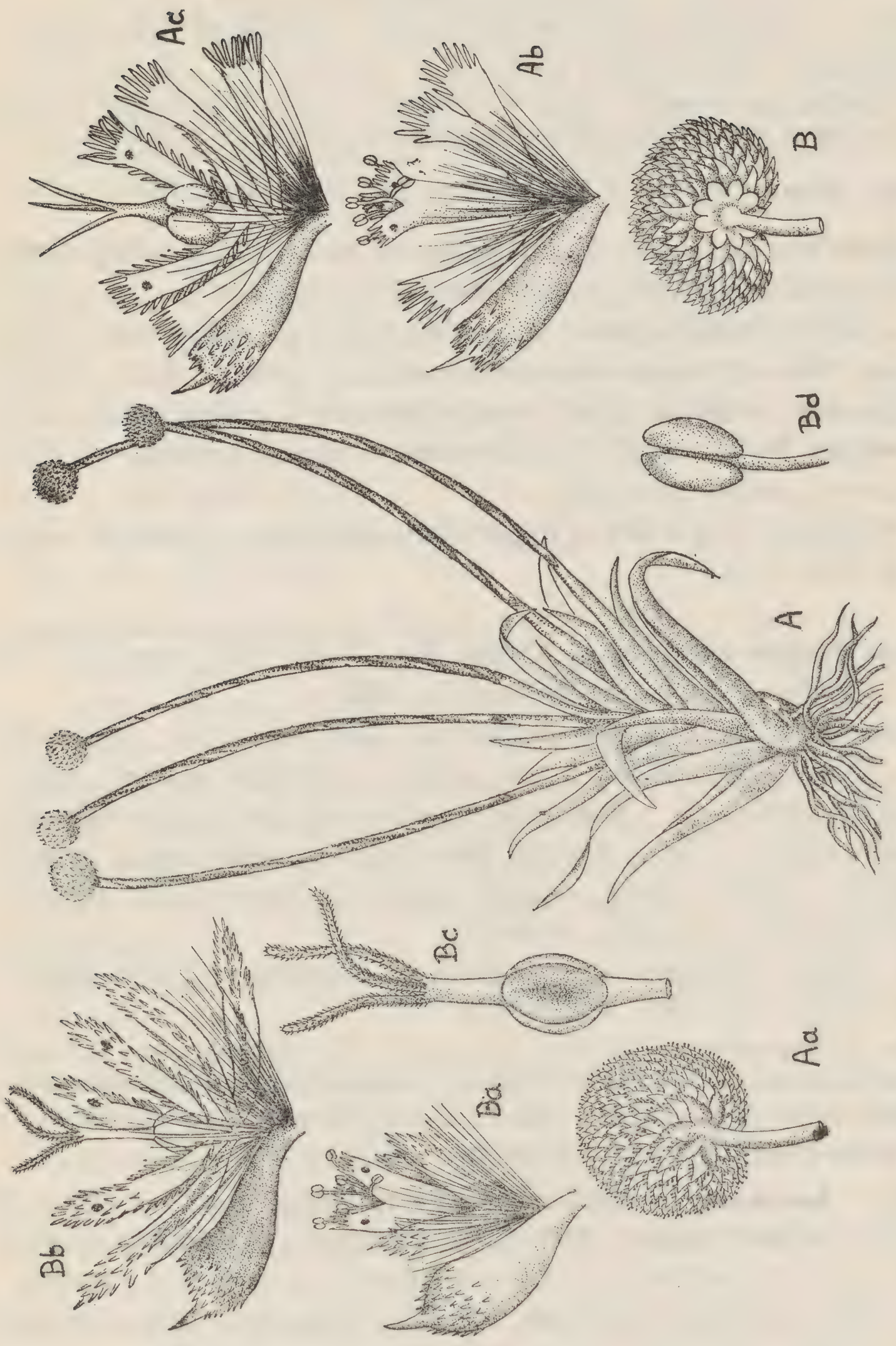


Fig. 109. ERIOCAULACEAE. *A. Eriocaulon quinquangulare*: habit; *Aa*, inflorescence; *Ab*, male floret; *Ac*, female floret. *B. Eriocaulon robusto-brownianum*: inflorescence; *Ba*, male floret; *Bb*, female floret; *Bc*, pistil; *Bd*, stamen.

Plants glabrous. Leaves capillary, to 5 cm long. Peduncles many, to 6 cm long. Heads to 0.3 cm across; bracts pale. Male floret: corolla lobes with an apical gland; anthers white or yellow. Female floret: sepals hyaline; petals strikingly linear, eglandular.

Paleotropics. Common in open marshes and rice fields of upper Ghats. October-January. *HFP* 1195B, 1376.

Note: *E. cinereum* is supposed to lack petals in female floret. It is possible that the reduced, linear petals in our specimens could represent a variant of *E. cinereum*.

Eriocaulon dianae Fyson, J. Indian Bot. 2: 259, t. 11. 1921.

var. **longibracteatum** Fyson, *l.c.*; Gamble, Fl. Madras 1620(1128). 1931.

Leaves linear-lanceolate, to 8 cm. Peduncles many, to 15 cm. Head to 7 mm across; receptacle pilose; involucral bracts glabrous, longer than floral bracts. Floral bracts obovate, acuminate, pilose. Male floret: calyx spathaceous, ciliate at apex; corolla lobes short, ciliate, with apical gland. Female floret: sepals 3, pubescent; 2 sepals keeled; one flat, much narrower; petals eglandular.

India. Common in marshes of upper Ghats and plain. June-January. *CJS* 15616, *HFP* 2432.

Eriocaulon eleanorae Fyson, J. Indian Bot. [1: 50. 1919, *nom.*] 2: 316. 1921; Gamble, Fl. Madras 1619(1127). 1931.

Leaves linear, to 6×0.13 cm. Peduncular sheath to 2 cm. Peduncles many, to 12 cm long. Head 3 mm across; receptacle sparsely hairy; involucral bracts glabrous. Floral bracts pubescent, spatulate, acuminate. Male floret: sepals 3, free; corolla lobes minute, with apical gland. Female floret: sepals 3, linear, winged; petals 3, linear, hairy at apex, with apical gland; ovary sessile; styles 3.

South W. India. Collected once in flower at Kempuhole (lower Shiradi Ghat) on October 28, 1969. *CJS* 15416.

Note: Our determination of *CJS* 15416 is tentative. Dr. Moldenke could not match this in his herbarium nor at New York. Typical *E. eleanorae* should have pistillate florets with sub-seriate sepals of which 2 are winged and one without a wing. Our specimen has all sepals thin, winged, pubescent and spongy.

Eriocaulon heterolepis Steudel, Syn. Pl. Glum. 2: 271. 1855; J. Hooker, Fl. Brit. India 6: 585. 1893; Moldenke, Phytologia 19: 338. 1970.

Leaves linear-lanceolate, to 7 cm. Peduncles many, to 1.4 cm; head to 5 mm across; receptacle sparsely hairy. Involucral bracts oblong, glabrous. Floral bracts obovate, acute, pilose. Male floret: calyx spathaceous, shortly hairy at apex; corolla lobes ciliate, with apical gland. Female floret: sepals 3, pubescent; 2 sepals keeled, one flat, much narrower; petals with apical gland.

South W. India. Common in marshes and rice fields of upper Ghats and plains. June-January. *CJS* 12300, *HFP* 1311.

Eriocaulon hookerianum Stapf, Trans. Linn. Soc. London, Bot. ser. 2, 4: 243. 1894; Moldenke, Phytologia 19: 69. 1970.

Leaves to 5×0.5 cm. Peduncles few, to 12 cm long; head to 4 cm across; receptacle glabrous. Involucral bracts oblong, glabrous. Floral bracts obovate, acute. Sepals 3, free. Petals eglandular.

Indomalaysia. Collected once in flower from a seasonal marsh of western plain (Bagi). August. *CJS* 14710.

Eriocaulon infirmum Steudel, Syn. Pl. Glum. 2: 272. 1855.

Leaves to 8×0.5 cm. Peduncles many, to 16 cm long; head 6 mm across; receptacle sparsely hairy. Involucral bracts oblong, glabrous. Floral bracts obovate, acute, pilose. Male floret: calyx spathaceous, split on one side, ciliate at apex; corolla lobes ciliate, with apical gland. Female floret: sepals 3, pubescent, keeled, one slightly narrower; petals ciliate, with apical gland.

India, Burma. Common in marshes of plain and Ghats. June-February. *HFP* 1295.

Eriocaulon nilagirense Steudel, Syn. Pl. Glum. 2: 271. 1855. *Eriocaulon brownianum* var. *nilagirense* (Steudel) Fyson, J. Indian Bot. 2: 263. 1921; Gamble, Fl. Madras 1619 (1127). 1931.

Leaves ensiform, to 30×1.3 cm. Peduncles few-many, to 40 cm, pubescent; head to 1.3 cm across; receptacle villous. Involucral bracts oblong, hairy. Floral bracts obovate, acute, pilose. Male floret: calyx spathaceous, ciliate at apex; corolla lobes ciliate, with minute apical gland. Female flower: sepals 3, keeled, two large; petals ciliate, eglandular.

India. Scattered in marshes of upper Ghats. September-January. *HFP* 995, 1178.

Eriocaulon polycephalum J. Hooker, Fl. Brit. India 6: 573. 1893; Moldenke, Phytologia 19: 351. 1970. *Eriocaulon longicuspis* J. Hooker var. *polycephalum* (J. Hooker) Fyson, J. Indian Bot. 2: 309. 1921; Gamble, Fl. Madras 1618(1127). 1931.

Leaves linear-ensiform, to 20×0.8 cm. Peduncles 1-many, to 50 cm, glabrous or pubescent; head 8 mm across; receptacle villous. Involucral bracts obovate, sparsely hairy. Floral bracts obovate, caudate. Male floret: sepals 3, free, ciliate at apex; corolla lobes hairy, with apical gland; one lobe longer than floral bract. Female floret: sepals 3, oblong, ciliate at apex; petals ciliate, cuneate, with apical gland.

Central & South India. Occasional in marshes of western plain and upper Ghats. June-December. *CJS* 12242, *HFP* 39.

Eriocaulon quinquangulare L., Sp. Pl. 87. 1753; Gamble, Fl. Madras 1620(1128). 1931.

Leaves linear, to 6 cm, red to pink. Peduncles many, to 14 cm long; head 4 mm across; receptacle with short hairs. Involucral bracts oblong, glabrous. Floral bracts obovate, acuminate, glabrous. Male floret: calyx spathaceous, hairy at apex; corolla lobes hairy at apex, with minute apical gland. Female floret: sepals 3, hairy at apex; petals oblanceolate, ciliate, with apical gland.

India, Burma, Sri Lanka. Frequent in marshes across plain and in upper Ghats. November-January. *CJS* 15203, *HFP* 1366.

Eriocaulon robusto-brownianum Ruhland in Engl., Pflanzenr. 13: 77. 1903; Gamble, Fl. Madras 1619(1127). 1931; Moldenke, Phytologia 19: 19. 1969.

A robust, hairy plant. Leaves ensiform, to 45×2 cm. Peduncles many, to 60 cm, pubescent; head 1 cm across; receptacle villous. Involucral bracts obovate, dorsally hairy. Floral bracts obovate, caudate-acuminate, hairy. Male floret: calyx spathaceous, hairy at apex; corolla lobes hairy at apex, with apical gland. Female floret: sepals 3, flat, hairy at apex; petals oblanceolate, ciliate, with apical gland.

South W. India. Fairly common in marshes of upper Ghats. July-January. *CJS* 10232, 11571.

Eriocaulon setaceum L., Sp. Pl. 87. 1753; Gamble, Fl. Madras 1618 (1126). 1931.

An aquatic, submerged plant with elongate stem. Leaves cauline; submerged ones filiform, convolutely sheathing. Peduncles many, to 6 cm long; head 2 mm across; receptacle with short hairs. Involucral bracts obovate, acute, glabrous. Floral bracts obovate, acute, glabrous. Male floret: calyx spathaceous, hairy at apex; corolla lobes minute, sparsely hairy at apex, eglandular. Female floret: sepals 3, obovate; petals filiform, with apical gland.

South India, Sri Lanka. Collected once in flower from Harihalli (western plain) on September 9, 1964. *CJS* 9009.

Eriocaulon truncatum Ham. in Wall., Pl. As. Rar. 3: 29. 1832; Gamble, Fl. Madras 1619(1127). 1931; Moldenke, Phytologia 19: 473. 1970.

Leaves subulate, to 3×0.2 cm. Peduncles few, to 6 cm; head 3 mm across; receptacle villous. Involucral bracts elliptic, glabrous. Floral bracts obovate, papillose-hairy at apex. Male floret: sepals 2, connate at base; corolla lobes minute. Female floret: sepals 2, hairy at apex; petals filiform, hairy with apex.

South India. Common on mountain peaks of Ghats. July-October. *CJS* 17813, *HFP* 2147.

137. JUNCACEAE

T. P. Ramamoorthy

JUNCUS Linnaeus

Tufted herbs. Leaves flat, terete or reduced. Inflorescence of irregular, compound cymes of heads, bracteate; lower bract often foliar. Flowers bisexual. Tepals 6, imbricate, persistent, linear, glumaceous, greenish-brown. Stamens 3 or 6, from the base of the perianth. Ovary superior, 1-3-locular; ovules many; style short; stigmas 3. Fruit a loculicidal, 3-valved, trigonous capsule.

Juncus prismatocarpus R. Br., Prodr. 259. 1810; Gamble, Fl. Madras 1553(1084). 1931.

Leaves flat, to 10×0.2 cm, transversely septate; sheath scarious, to 2 cm. Tepals to 4 mm long. Inflorescence sometimes viviparous. Stamens 6, included. Ovary 1-locular; ovules parietal.

Subtropical to tropical Indomalaysia. Common in water-logged fields across District. October-July. *CJS* 12801, *HFP* 2506.

138. CYPERACEAE

S. S. Hooper

Generally monoecious terrestrial herbs, often of seasonally or permanently wet habitats. Fibrous rooted annuals or perennials, and then often rhizomatous. Rhizome scales thin or fibrous, grading into the cauline leaves. Cauline stem solid, often trigonous, often leafy at the base only. Branches usually bearing at the base a 2-keeled or -lobed prophyll. Leaves often 3 ranked, bifacial and linear with a long entire generally eligulate sheath, without articulation between sheath and blade. Inflorescence generally bracteate, often capitate or anthelate. Flowers inconspicuous, solitary in the axils of small chaffy bracts (glumes) generally aggregated distichously into flattened or spirally into terete spikelets, bisexual or unisexual. Perianthal (hypogynal) structures absent or more or less bristle-like. Stamens free, often 3; filaments long, often persistent; anthers basifixed, of 2 dehiscent pollen sacs often with sterile basal tips and a crested connective. Pollen commonly 3-aperturate pseudomonads. Ovary superior, unilocular. Ovule solitary, basal, erect, anatropous, endospermic. Style 1, terminal, filiform or thickened and hardened below. Stigmas (style branches) generally 2 or 3, papillate. Fruit (achene, nut) indehiscent, hard walled with free pericarp and testa; generally trigonous or flattened. Anatomy with (chlorocyperoid) or without (eucyperoid) an

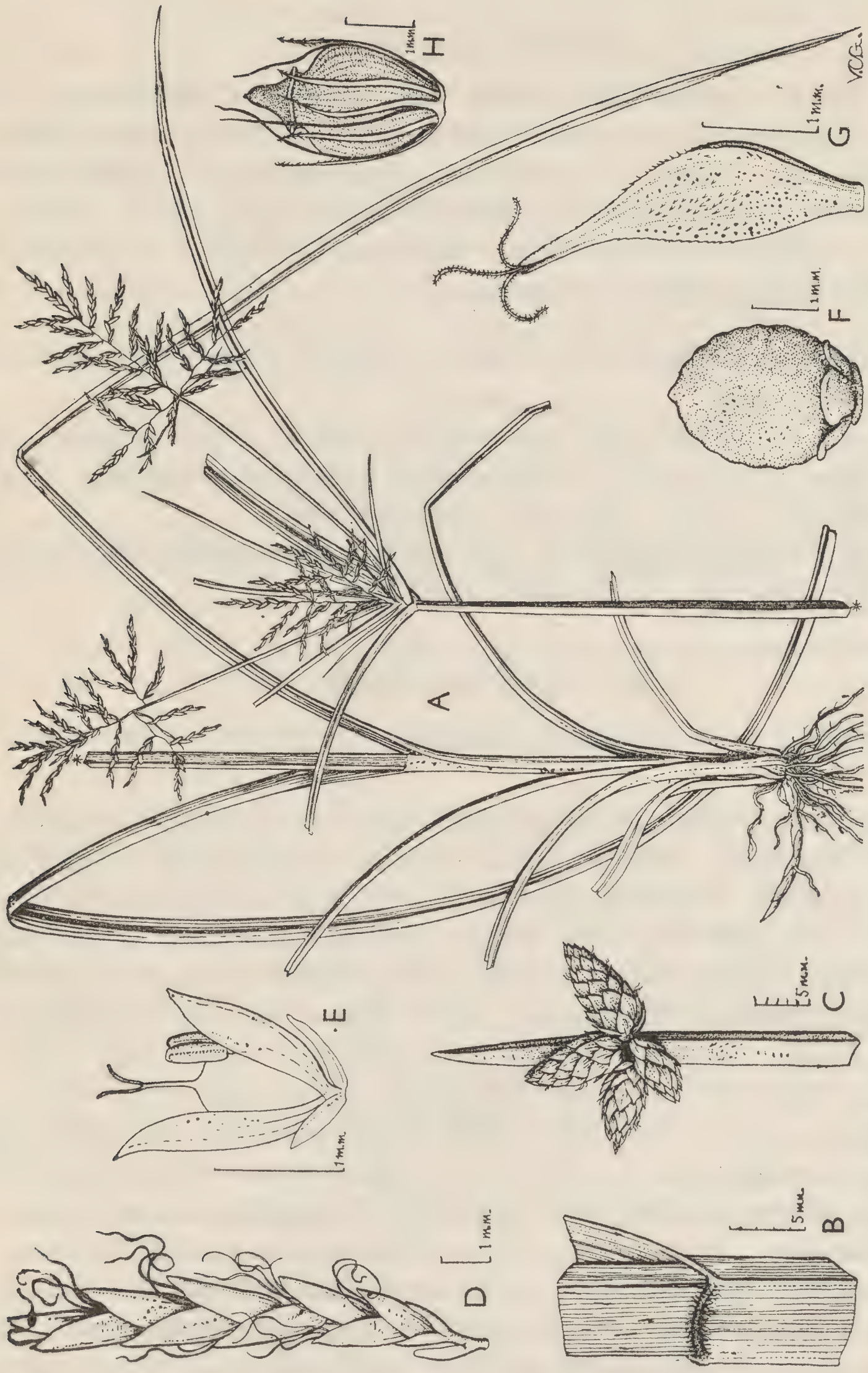


Fig. 110. CYPERACEAE. *A. Cyperus distans*: habit showing anthelate inflorescence; *B. Scleria terrestris*: contraligule; *C. Schoenoplectus mucronatus*: pseudolateral sessile terete spikelets. *D. Cyperus rotundus*: distichous glumes of spikelet. *E. Kyllinga*: single flowered spikelet. *F. Scleria foliosa*: nut, with disc. *G. Carex glaucina*: utricle. *H. Eleocharis acutangula*: nut with bristles.

inner chlorenchymatous layer to the bundle sheath; silica bodies present.

Note: Embryo types—see Van der Veken, *Bull. Jard. Bot. Brux.* 35: 285-354. 1965.

1 All leaves reduced to sheaths or at most to mucros.
2 Hypogynal bristles absent.....**Fimbristylis**
2 Hypogynal bristles present.
3 Inflorescence terminal; bract glume-like.....**Eleocharis**
3 Inflorescence pseudo-lateral; bract stem-like.....**Schoenoplectus**
1 All leaves not reduced to sheaths; distinct lamina present.
4 Leaves with a collar around stem.....**Fuirena**
4 Leaves without a collar around stem.
5 Contra-ligule present.
6 Leaf margin saw-toothed; stigmas 1-2.....**Rhynchospora**
6 Leaf margin not saw-toothed; stigmas 3.....**Scleria**
5 Contra-ligule absent.
7 Stem with leaf-like bracts throughout.....**Diplacrum**
7 Stem without leaf-like bracts throughout.
8 Nut enclosed in utricular scale.
9 Spikelet one-flowered; flowers bisexual.....**Ascopholis**
9 Spikelet many-flowered; flowers unisexual.....**Carex**
8 Nut not enclosed in utricular scale.
10 Hypogynal structures present.
11 Hypogynal structures scaly, membranous.
12 Leaves acicular; spikes pseudo-lateral.....**Hemicarpha**
12 Leaves bifaced; spikes terminal.
13 Spikes sessile, compact.....**Lipocarpha**
13 Spikes stalked, subcorymbose.....**Hypolytrum**
11 Hypogynal structures setaceous.....**Bolboschoenus**
10 Hypogynal structures absent.
14 All or upper glumes spiral.
15 Style base not dilated.....**Rikliella**
15 Style base dilated.
16 Style base articulated with ovary, caducous.....**Fimbristylis**
16 Style base not articulated, persistent on nut.....**Bulbostylis**
14 All glumes distichous.
17 Style base deciduous.....**Fimbristylis**
17 Style base persistent.
18 Rachilla articulated, deciduous.
19 Spikes stalked.
20 Stigmas 2.....**Queenslandiella**
20 Stigmas 3.
21 Keel of nut-bearing glume winged.....**Courtoisia**
21 Keel of nut-bearing glume not winged.....**Mariscus**
19 Spikes sessile.....**Kyllinga**
18 Rachilla not articulated, persistent.
22 Nut flattened with one edge against rachilla.....**Pycreus**
22 Nut trigonous or if flattened one edge not against rachilla.....**Cyperus**

ASCOPHOLIS Fischer

Inflorescence capitate, *Kyllinga*-like. Spikelets terete, one-flowered,

spicate on a short axis. Glume and prophyll surrounding a single fertile partly tubular glume. Flowers bisexual. Stamens 3. Stigmas 3, smooth. Nut with a beak continuous with the style.

Ascopholis gamblei Fischer, Bull. Misc. Inf. 104. 1931 et in Hook., Ic. Pl. 32 t. 3183. 1933.

Perennial. Stems to 12 cm, bulbously thickened at the base by papery brown leaf-sheaths. Style trigonous. Nut obscurely trigonous.

Deccan. Rare, near Arsikere, in an area of dry deciduous forest. October. *HFP* 2236.

BOLBOSCHOENUS (Ascherson) Palla

Stoloniferous, tuberiferous perennials. Stem triquetrous, with bladed leaves to above middle; lower sheaths often septate, nodose. Inflorescence terminal, corymb-like or capitate; bracts leafy. Spikelets large. Flowers bisexual. Glumes thin, membranous, retuse with a slender midrib excurrent in an awn. Stamens 3. Bristles usually present. Nut large, 2.5-4 mm long, more or less smooth. Embryo schoenoplectoid. Anatomy eucyperoid.

Note: Species of the heterogenous genus *Scirpus* of earlier workers are here included under *Bolboschoenus, Hemicarpha, Isolepis, Rikliella* and *Schoenoplectus*. Further work is needed to establish satisfactory boundaries for some of these genera whose justification at present depends largely on differences in embryo structure.

Bolboschoenus maritimus (L.) Palla in Koch, Syn. Deutsch. Fl. ed. 3, 2532. 1904. *Scirpus maritimus* L., Sp. Pl. 51. 1753; Gamble, Fl. Madras 1666(1156). 1931.

Stolons thin. Stems to 80 cm long. Leaves flat, linear, to 40 cm long, acuminate, ligulate; sheaths long. Inflorescence anthelate, loose; rays 5-8, slender. Spikelets ovoid to cylindric, 10-20 × 4-5 mm, terete, acute. Glumes oblong, hispidulous; margins membranous, fimbriate. Bristles 6, sometimes fewer, retrorsely scabrid. Styles 2. Anther crest papillate. Nut obovate, compressed-trigonous, smooth.

Northern hemisphere, Australia. Locally common on eastern plains in standing water. June-November. *CJS* 13747, *HFP* 2394.

BULBOSTYLIS Kunth *nom. cons.*

Leaves narrow, often filiform and pubescent; mouth of the sheath generally with needle-like hairs. Bracts generally leaflike. Spikelets angular. Rachilla persistent, narrowly winged. Glumes spiral, generally pubescent, deciduous, 0-1; basal glumes sterile. Flowers bisexual. Perianthal structures absent. Stamens 1-2. Style base enlarged, becom-

ing more or less hardened, persistent on the nut; style deciduous above the style base. Nut usually trigonous, usually with vertically elongated surface cells. Anatomy chlorocyperoid; embryo bulbostyloid.

1 Spikelets congested in a head.....*B. barbata*
1 Spikelets solitary.....*B. densa*

Bulbostylis barbata (Rottb.) C. B. Clarke in J. Hooker, Fl. Brit. India 6: 651. 1893; Gamble, Fl. Madras 1662(1153). 1931. *Scirpus barbatus* Rottb., Descr. Pl. Rar. Programm. 27. 1772 et Descr. Ic. Pl. 52 t. 17, f. 4. 1773.

Tufted annual. Stems to 20 cm. Leaves glabrous except at the sheath mouth. Inflorescence hemispherical, about 1 cm across; bracts filiform, short. Spikelets linear-oblong, acute. Glumes red-brown with strong green, curved, excurrent keel. Nut obovoid, trigonous, finely reticulate by isodiametric surface cells.

Paleotropics (*and as weed elsewhere*). Scattered throughout region on sandy soil by roadsides or at the edge of damp depressions. June-October. *CJS* 13903, *HFP* 2237, 2344.

Bulbostylis densa (Wall.) Hand.-Mazzetti in Karsten & Schenk, Vegetationsb. 20, 7: 16. 1930. *Scirpus densus* Wall. in Roxb., Fl. Ind. 1: 231. 1820. *Isolepis trifida* Nees in Wight, Contrib. Bot. India 108. 1834. *Bulbostylis capillaris* (L.) C. B. Clarke var. *trifida* (Nees) C. B. Clarke in J. Hooker, Fl. Brit. India 6: 652. 1893; Gamble, Fl. Madras 1662(1153). 1931.

Delicate tufted annuals. Stems 2-15 cm. Leaves glabrous except at sheath mouth. Spikelets few, solitary, elliptic, about 3×1.5 mm, acute. Glumes dark brown, broadly ovate, obtuse, sometimes muticous. Nut obovate, triquetrous, surface granular, slightly transversely wrinkled.

Paleotropics. Occasional on sandy slopes by roadsides or in dry deciduous forest in western plains and Ghats. September-October. *CJS* 14733, *HFP* 2266.

Note: Perhaps not specifically distinct from the N. American *B. capillaris* (L.) C. B. Clarke.

CAREX Linnaeus

Medium to large herbs. Stems erect, leafy. Leaves flat, ligulate. Female spikelet reduced to a single ovary enclosed in a flask-shaped utricle and clustered into female or bisexual spikes. Stigmas 2 or 3.

1 Spikes few, entirely or predominantly either male or female.....*C. maculata*
1 Spikes numerous, each one female below and male above.
2 Glumes straw-colored.....*C. indica*
2 Glumes purple-brown.....*C. glaucina*

Carex glaucina Boeckeler, Linnaea 40: 353. 1876. *Carex mercarensis* Hochstetter ex Steudel var. *major* Steudel ex C. B. Clarke in J. Hooker, Fl. Brit. India 6: 719. 1894. *Carex lindleyana* Nees var. *major* (Steudel) Fischer in Gamble, Fl. Madras 1687(1169). 1931.

Leaves 7.5-10 mm wide with a dark ligule; old sheaths becoming fibrous. Inflorescence 30-50 cm with 2 (rarely 1) branched partial panicles at each node; bracts leafy; rachis angular, hispid. Spikes linear with male portion forming about 1/4 total length. Female glumes about 2 mm long, dark purple-brown, subacute with a short scabrid arista. Utricle exceeding glume, hispid or scabrous above; beak 1-1.25 mm long with a membranous, entire or bifid tip.

Western Ghats, Mauritius. Occasional on rocky outcrops and other openings in forest in Ghats. October. *CJS* 15300, *HFP* 2291.

Note: This is one of a group of closely related South Indian species of the Section *Indicae,* having small, generally numerous spikes, female at the base and male above. The three syntypes of Boeckeler's *C. glaucina* seem to me conspecific and distinguishable from both *C. filicina* Nees, where Kuekenthal placed two, and *C. raphidocarpa* Nees where he placed the third. Both *C. filicina* and *C. raphidocarpa,* species found as close as the Nilgiris, have glabrous utricles over 3 mm long with the beak forming half or more of this length. *C. raphidocarpa* further differs in having the spikes ellipsoid, not cylindric in fruit. *C. mercarensis* Steud. var. *mercarensis* comes from the Nilgiris and seems to equal *C. raphidocarpa*. *C. lindleyana* Nees, also a species of the Nilgiris, has quite distinct short, suberect spikes crowded into spike-like partial panicles and only resembles *C. glaucina* in the length of the utricle beak. The report of this species from Mauritius rests unconfirmed (and probably now unconfirmable) on a Bojer specimen.

Carex indica L., Mant. Alt. 574. 1771; J. Hooker, Fl. Brit. India 6: 714. 1894; Kueken. in Engl., Pflanzenr. 38: 262, f. 40. 1909.

Stem to 100 cm, triangular, smooth. Leaves basal, about 1 cm wide, pale with purple-veined sheaths and dark ligule. Inflorescence of several remote, oblong, long-stalked partial panicles. Spikes linear, spreading, pale. Bracts leafy, much exceeding inflorescence. Bracteoles and lower (or all) female glumes hispid and with a scabrid arista. Male portion of spike equaling or exceeding female. Utricle ellipsoid to subglobose with an entire, very oblique mouth.

Indomalaysia. Rare in Ghats, in partial shade of forest clearing at Kempuhole. December. *CJS* 15855.

Note: This species appears to be previously unrecorded for Karnataka and to be rare in Southern India, though well known in Sri Lanka. The Hassan specimen is immature.

Carex maculata Boott, Trans. Linn. Soc. London 20: 128. 1846; Ill. 1: 9, t. 26. 1858; Gamble, Fl. Madras 1686(1169). 1931.

Tufted. Leaves basal, about 7.5 mm broad with a membranous face to sheath and long, acute ligular zone. Bracts overtopping inflorescence, leafy, with a long keeled sheath. Spikes about 6, the uppermost male, the rest female or sometimes male at the tip; lowermost spike distant,

long-pedicellate, noddind; rest more or less clustered; cylindric, with many crowded spikelets. Female glumes lanceolate, acute, brown with a green midrib, shorter than the utricle. Utricle broadly elliptic, somewhat compressed, covered with brown-purple dots and raised nerves; beak short, almost entire. Stigmas 3. Male glumes lanceolate, reddish-brown.

Peninsular India to Japan, ? Australia. Rare in upper Ghats, in partial shade in a wet deciduous forest at Byakarhalli, Bisle Ghat. May *HFP* 104.

COURTOISIA Nees

Glabrous annuals. Leaves basal. Inflorescence once anthelate. Spikelets compressed, few-flowered, congested in spikes. Rachilla scarcely winged, disarticulating at the base. Flowers bisexual. Perianthal structures lacking. Stamens 3. Style very short. Style base continuous with and persistent on the nut. Stigmas 3. Nut trigonous.

Note: The genera *Courtoisia, Cyperus, Kyllinga, Mariscus, Pycreus* and *Queenslandiella* distinguished here, are, by some authors, all included under *Cyperus*. Further work on a worldwide basis may establish divisions more broadly based than the above which depend much on embryo type and physiology for their distinction.

Courtoisia cyperoides (Roxb.) Nees, Linnaea 9: 286. 1834; Gamble, Fl. Madras 1645(1143). 1931. *Kyllinga cyperoides* Roxb., Fl. Ind. 1: 187. 1820, non *Scirpus cyperoides* L.

Stems to 60 cm, bearing 1-2 leaves. Inflorescence 1-3× anthelate; bracts much exceeding rays. Spikes globose, congested. Spikelets broadly elliptical, flattened, 1-2 flowered. Glumes elliptical with a strong, winged keel excurrent in a short recurved mucro. Nut linear-oblong, strongly puncticulate.

Tropical Africa, Indomalaysia. Occasional, as rice field weed or in marshes in western plains and Ghats. November-January. *CJS* 16089, *HFP* 2472.

CYPERUS Linnaeus

Stems often terete below, trigonous above, generally leafy in the lower part. Inflorescence capitate or, more often, once, twice or rarely more anthelate; each ray usually subtended by a bract. Spikelets sessile or shortly peduncled, often ovoid or elliptical, slightly to strongly flattened, bearing distichous, often imbricate, dehiscent glumes on a more or less zigzag, often winged rachilla. Flowers bisexual, without perianth. Stamens generally 3. Stigmas generally 3. Nut often trigonous.

Note: *Juncellus* C. B. Clarke is included here.

1 Inflorescence a single head or cluster of few to many sessile spikelets; no rays present.
2 Spikelets many, in a dense head, crowded so that individual spikelets are obscured.
3 Glumes mucronate with sharp, green keels.....*C. michelianus* ssp. *pygmaeus*
3 Glumes cucullate with rounded pale keels.....*C. pulchellus*
2 Spikelets few in a cluster, individual spikelets clear.
4 Spikelet cluster apparently lateral with a single erect bract. Glumes obtuse, whitish .....*C. laevigatus*
4 Spikelet cluster terminal. Glumes mucronate.
5 Stem bases thickened by papery, inflated sheaths. Glumes red-brown..*C. rubicundus*
5 Stem bases not thickened. Glumes silvery to golden.....*C. compressus*
1 Inflorescence with spikelets in more than one cluster or spike; some rays present.
6 Rays few, 1-3. Spikelets in sessile clusters. Annuals.
7 Spikelets 3 mm wide. Glumes silvery to golden with straight broad green tips..... .....*C. compressus*
7 Spikelets 1-2 mm wide. Glumes brown with green recurved tips.
8 Glume retuse with strong arista and nerveless sides.....*C. cuspidatus*
8 Glume acute with flexuose arista and clearly nerved (ribbed) sides.....*C. squarrosus* (see under *Mariscus squarrosus*)
6 Rays many. Spikelets in clusters or spikes, sometimes with secondary rays present. Annuals or perennials.
9 Secondary rays absent or occasional on unusually large specimens.
10 Spikelets in digitate clusters.
11 Spikelets small, very numerous, black or red-brown.....*C. difformis*
11 Spikelets large, not very numerous, brown. Stem showing rings, at least when dry.....*C. articulatus*
10 Spikelets in spikes.
12 Spikes ovoid or hemispherical, that is, with a short rachis.
13 Spikelets golden, compressed when young, quadrangular when in furit..... .....*C. tenuiculmis*
13 Spikelets red-brown, more or less compressed even in fruit.
14 Plants with several leaves. Glumes overlapping.....*C. rotundus*
14 Plants with 1-2 leaves only. Glumes not overlapping.....*C. pangorei*
12 Spikes cylindric, that is, with a long rachis.
15 Spikelets golden.
16 Spikelets erect or sub-erect, in lax spikes.....*C. iria*
16 Spikelets spreading, in crowded spikes.....*C. digitatus*
15 Spikelets red-brown, very remote; rachis hairy.....*C. pilosus*
9 Secondary rays normally present.
17 Spikelets in digitate groups or clusters.
18 Spikelets 2-3 mm wide. Glumes ovate, mucronate.....*C. pubisquama*
18 Spikelets less than 2 mm wide. Glumes oblong, apiculate.
19 Annual. Anther with smooth connective. Nut rounded.....*C. tenuispica*
19 Perennial. Anther with bristly connective. Nut angular.....*C. haspan*
17 Spikelets in spikes.
20 Spikes ovoid or obovoid, lax-spikeletted; internodes on the rachis visible.
21 Spikelets acuminate.....*C. distans* var. *distans*
21 Spikelets acute, suberect.....*C. pangorei*
20 Spikes cylindrical, dense-spikeletted; internodes obscured.
22 Spikelets elliptic, golden. Glumes incurved with a rounded keel..*C. alopecuroides*
22 Spikelets linear, black or brown. Glumes straight or excurved with a sharp keel.

23 Glumes appressed, mucronate.....*C. exaltatus*
23 Glumes spreading, apiculate.
24 Glumes more than half overlapping, retuse and mucronate.....*C. nutans* var. *eleusinoides*
24 Glumes less than half overlapping, obtuse and apiculate.....*C. distans* var. *pseudonutans*

Cyperus alopecuroides Rottboell, Descr. Pl. Rar. Programm. 20. 1772; Kueken. in Engl., Pflanzenr. 101: 71. 1935. *Juncellus alopecuroides* (Rottb.) C. B. Clarke in J. Hooker, Fl. Brit. India 6: 595. 1893; Gamble, Fl. Madras 1628(1133). 1931; Kern in Backer & Bakh. f., Fl. Java 3: 472. 1968.

Stout, rhizomatous perennial. Stem 1-1.5 m × 4-8 mm, rounded below, trigonous above. Leaves leathery, to 15 mm wide, pale beneath, gradually acuminate, with red brown split sheaths. Bracts leaflike, longest 2-3× rays. Rays unequal, flattened, smooth, the longest branched. Spikes digitately clustered, or solitary, cylindric, to 45×10 mm. Spikelets densely crowded, ovate, 3-5×2-2.5 mm. Glumes ovate-elliptic, 1.5 mm long, apiculate with broad rounded keel and nerveless red-brown sides. Styles 2. Nut obovoid, pale brown, compressed dorsoventrally.

Old World tropics & subtropics, West Indies. In or near water, plains. October-March. *CJS* 15701, *HFP* 1421.

Cyperus articulatus L., Sp. Pl. 44. 1753; Gamble, Fl. Madras 1641 (1140). 1931; Kueken. in Engl., Pflanzenr. 101: 77. 1935.

Robust rhizomatous leafless perennial. Stems to 2 m ×15 mm, spongy, terete, transversely septate (observe dry). Leaves reduced to 1-2 papery, brownish or purplish sheaths. Bracts less than 1 cm, papery, brownish, acute. Rays up to 10 cm, markedly unequal, some with secondary rays, bearing digitate clusters of spikelets. Spikelets 1-1.5 cm, linear, sub-compressed, pale brown, acute. Glumes 2.5-3.0 mm, elliptical, acute with narrow green keel and membranous margin. Nut 1.3-1.5× 0.5-0.6 mm, oblong, blackish, apiculate.

Pantropics & subtropics. In or by water, deciduous forest area, western plains. October-March. *CJS* 12866, *HFP* 2249, 2343.

Cyperus compressus L., Sp. Pl. 46. 1753. emend. Dandy in Exell, Cat. S. Tome 357. 1944; Gamble, Fl. Madras 1640(1140). 1931; Kueken. in Engl., Pflanzenr. 101: 156. 1935; Kern in Backer & Bakh. f., Fl. Java 3: 480. 1968.

Tufted annual. Leaves few, obtuse, rigid, with purple sheaths. Bracts leaflike, erect or spreading. Rays 0-few. Spikelets digitately clustered, oblong, about 12×2.5 mm, strongly compressed, silvery. Glumes ovate, 3-4 mm, acuminate with a sharp green keel and nerved,

membranous, brown or silvery sides. Nut obovate, dark brown to black.

Pantropics. Damp sandy places in lower Ghats, occasional. October. *HFP* 2268.

Cyperus cuspidatus Kunth in Humb., Bonpl. & Kunth, Nov. Gen. Sp. 1: 204. 1816; J. Hooker, Fl. Brit. India 6: 598. 1893; Kueken. in Engl., Pflanzenr. 101: 261. 1936. *Cyperus uncinatus* auct. non Poir. 1806: Gamble, Fl. Madras 1639(1139). 1931.

Small, tufted annual. Stem to 2-10 cm high. Leaves equaling stems, setaceous. Bracts spreading, 3-4 × longer than rays. Rays few, short. Spikelets digitately clustered, linear, 8×1 mm, strongly compressed. Glumes oblong, about 1.5 mm long with a green, recurved mucro and 1-nerved, castaneous sides. Nut oblong or obovate, reddish brown.

Pantropical. Damp sandy place, in dry deciduous forest (Bourdalboore). *HFP* 2347.

Note: *Cyperus castaneus* Willd. is a similar species but with spikelets less than 1 mm wide, darker in color and the mucro much shorter than the glume; it may turn up in Hassan.

Cyperus difformis L. in Torner, Cent. Pl. 2: 6. 1756; Gamble, Fl. Madras 1640(1139). 1931; Kueken. in Engl., Pflanzenr. 101: 77. 1935; Kern in Backer & Bakh. f., Fl. Java 3: 475. 1968.

Tufted, rather weak annual or short-lived perennial with purple roots. Leaves few, suddenly acuminate. Bracts 2-3, unequal, erect or spreading, leaf-like, exceeding rays. Rays few, to 3 cm long. Inflorescence of several globose, dense clusters of spikelets. Spikelets linear-lanceolate, small, to 4×0.75 mm, slightly compressed, obtuse. Glumes few, remote, ovate-orbicular, deciduous; keel sharp becoming rounded in fruit; sides nerveless, membranous. Nut elliptical to obovoid, broader than the glume when mature.

Tropics & subtropics. Wet places; rice field weed. August-November. *CJS* 14274, *HFP* 2413.

Cyperus digitatus Roxburgh, Fl. Ind. 1: 209. 1820; Gamble, Fl. Madras 1642(1141). 1931.

var. **hookeri** (Boeck.) C. B. Clarke in J. Hooker, Fl. Brit. India 6: 618. 1893.

Shortly rhizomatous or tufted perennial. Stems to 1.5 m, sharply trigonous above, thickened by purple-tinged leaf-sheaths at base. Inflorescence once anthelate. Spikes solitary or clustered, 3-6 together, cylindric, to 5×1.5 cm, deep golden. Spikelets crowded, spreading or suberect, about 8×1.5 mm. Glumes oblong, acute, apiculate with golden membranous sides, green-nerved keel and conspicuous golden wings. Nut trigonous, dark brown.

India, Sri Lanka, Burma. Wet places in Ghats. November. *HFP* 2477.

Note: Typical variety *digitatus* may occur.

Cyperus distans L. f., Suppl. Pl. 103. 1781; Gamble, Fl. Madras 1640 (1140). 1931; Kueken. in Engl., Pflanzenr. 101: 137. 1935; Kern in Backer & Bakh. f., Fl. Java 3: 481. 1968.

1 Spikelets distant, spreading at maturity.....var. *distans*
1 Spikelets crowded, erect at maturity.....var. *pseudonutans*

var. **distans**

Somewhat caespitose perennial. Stems to 50 cm, trigonous. Leaves few, membranous side of sheath enlarged at mouth, purplish below. Inflorescence twice anthelate; bracts spreading. Spikes branched, with few, distant spikelets. Spikelets spreading, to 10×1 mm, linear with fine sharp tips and a zig-zag rachilla. Glumes overlapping only slightly, elliptical, obtuse, dark red-brown with a membranous margin. Nut ellipsoid, trigonous.

Tropics & subtropics. Wet places, rice fields in Ghats. October-November. *HFP* 1027, 2473.

var. **pseudonutans** Kueken. in Engl., Pflanzenr. 101: 140. 1935. *Cyperus nutans* auct. non Vahl: J. Hooker, Fl. Brit. India 6: 607. 1893 in part.

Rhizomatous perennial. Stems to 90 cm. Spikes rather dense-spikeletted. Spikelets erect or suberect. Otherwise as var. *distans*.

Tropical Africa, Mascarenes, India to Taiwan. Ghats, by water, frequent. September-November. *CJS* 14752, *HFP* 2320, 2455.

Note: The second variety is, it may be assumed, confused with *C. nutans* Vahl in the *Flora of Madras*. They are very similar in general aspect. Careful attention to the shape and spacing of the glumes is needed to separate them.

Cyperus exaltatus Retzius, Obs. 5: 11. 1789; Gamble, Fl. Madras 1642(1141). 1931; Kueken. in Engl., Pflanzenr. 101: 64, f. 9 A-E. 1935; Kern in Backer & Bakh. f., Fl. Java 3: 480. 1968.

Rhizomatous perennial. Stem to 1.2 m, leafy below, trigonous. Sheaths long, tough, dark purple. Bracts to 4 mm wide, exceeding rays. Inflorescence twice anthelate. Spikes narrowly cylindrical 40-60×5 mm. Spikelets elliptic, dark brown, sub-erect. Glumes broadly ovate, obtuse, sometimes black edged, with green keel and sharp mucro. Nut ovate to elliptic, apiculate.

Paleotropics & into subtropics. Eastern and western plains, common in marshy ground. September-January. *CJS* 15668, *HFP* 2051, 2280.

Cyperus haspan L., Sp. Pl. 45. 1753; Gamble, Fl. Madras 1640(1139). 1931; Kueken. in Engl., Pflanzenr. 101: 247. 1935; Kern in Backer & Bakh. f., Fl. Java 3: 476. 1968 ('*halpan*').

1 Generally tufted plants. Glume to 1 mm long. Stamen generally 1 . . . . . ssp. *haspan*
1 Rhizome generally long-creeping. Glume more than 1 mm. Stamens generally 3 . . . . . ssp. *juncoides*

ssp. **haspan**

Rhizome slender, generally short. Stems to 25 cm, sharply trigonous, with or without a bladed leaf. Bracts shorter than rays. Spikelets about 1 cm, elliptic, in clusters of 4-10. Glumes elliptic, 1 mm long, dark brown. Stamens 1 (2). Nut sharply angular, stipitate, smooth to slightly warty.

Pantropics & into subtropics. Rather uncommon, in shallow water or marshy ground in plains and Ghats. *HFP* 2334, 2417.

ssp. **juncoides** (Lamarck) Kuekenthal in Feddes Repert. 23: 184. 1926; Kern in Backer & Bakh. f., Fl. Java 3: 476. 1968. *Cyperus juncoides* Lamarck, Ill. Gen. 1: 147. 1791.

Rhizome generally long-creeping. Stems to 40 cm, winged. Spikelets often in 3's. Glume 1.2-1.6 mm. Stamens 3. Otherwise as ssp. *haspan.*

Distribution probably as ssp. *haspan.* Common in damp, open situations in Ghats extending into eastern plains. October-July. *CJS* 16234, *HFP* 2256.

Cyperus iria L., Sp. Pl. 45. 1753; Gamble, Fl. Madras 1640(1140). 1931; Kueken. in Engl., Pflanzenr. 101: 150. 1935; Kern in Backer & Bakh. f., Fl. Java 3: 479. 1968.

Tall, tufted annual. Stems to 60 cm, triquetrous. Leaves few, scabrid toward apex, with papery sheaths. Bracts leaf-like, exceeding rays. Spikes cylindrical, lax. Spikelets compressed, perspicaceous, erectopatent, golden-yellow. Glumes obovate, obtuse, keeled, spreading, with nerveless sides and membranous upper edge. Style hardly any. Nut obovate-elliptic, somewhat exceeding glume when mature, with concave smooth sides.

Paleotropics & into subtropics. Common as weed of rice fields and in other wet places. September-November. *CJS* 15050, *HFP* 2240, 2411.

Cyperus laevigatus L., Mant. Alt. 179. 1771; Kueken. in Engl., Pflanzenr. 101: 321. 1935. *Juncellus laevigatus* (L.) C. B. Clarke in J. Hooker, Fl. Brit. India 6: 596. 1893; Gamble, Fl. Madras 1629 (1133). 1931.

Perennial with often long, creeping rhizome covered with obtuse, brown scales. Stems 10-30 cm, rigid, compressed, trigonous. Leaves reduced to brown, papery sheaths except the uppermost. Blade short, rigid, terete, obtuse. Bracts two, one erect, conspicuous, the other spreading, small. Inflorescence a pseudolateral cluster of 2-12, generally sessile spikelets. Spikelets oblong-lanceolate, about 5-10×2.0 mm,

turgid. Glumes broadly ovate, obtuse and apiculate, white or pale, membranous with a narrow green midrib, imbricate. Stigmas 2. Nut ovate or obovate, flattened.

Pantropics & into subtropics. Occasional in moist, sandy places in eastern plains. September-December. *HFP* 2406.

Cyperus michelianus (L.) Link, Hort. Bot. Berol. 1: 303. 1827. *Scirpus michelianus* L., Sp. Pl. 52. 1753.

ssp. **pygmaeus** (Rottboell) Ascherson & Graebner, Synops. Mitteleur. Fl. 2, 2: 273. 1904; Kueken. in Engl., Pflanzenr. 101: 312. 1935. *Cyperus pygmaeus* Rottboell, Descr. & Ic. 20, t. 14, f. 5. 1773; Kern in Backer & Bakh. f., Fl. Java 3: 472. 1968. *Juncellus pygmaeus* (Rottboell) C. B. Clarke in J. Hooker, Fl. Brit. India 6: 596. 1893; Gamble, Fl. Madras 1629(1133). 1931.

Small, tufted leafy annual. Stems 3-20 cm. Leaves equaling stems, flat with inflated, papery, purplish sheaths. Bracts conspicuous, spreading, broadened at the base. Inflorescence a dense, lobed head, 1.0-1.5 cm across. Spikelets numerous, many flowered, compressed, often curved. Glumes ovate-lanceolate, about 2 mm long, acuminate with a broad obtuse, green keel and membranous, nerveless sides. Style short. Stigmas 2. Nut oblong, plano-convex, pale brown, bordered.

Paleotropics. Rare in seasonally marshy places in eastern plains at Nagpuri. September. *HFP* 597.

Note: The generic position of this species is unsatisfactory. Its morphological affinities are with *Scirpus s.l.* but since this large genus is in process of being divided along lines not yet clearly defined, the position of this species is left for the time being uncertain.

Cyperus nutans Vahl, Enum. Pl. 2: 363. 1805; Gamble, Fl. Madras 1640(1140). 1931; Kern, Reinwardtia 2: 111. 1952.

var. **eleusinoides** (Kunth) Haines, Bot. Bihar Orissa 898(941). 1924. *Cyperus eleusinoides* Kunth, Enum. 2: 39. 1837.

Shortly rhizomatous perennial to 1 m high. Stems trigonous, leafy below. Leaves shorter than stems; sheaths yellow brown (at least when dry). Bracts leafy, exceeding rays. Spikes numerous, 20-30 × 8 mm. Spikelets linear or narrowly elliptical, 8-10 × 1 mm. Glumes lanceolate, 2.25 mm, clearly nerved with a membranous margin and straight or recurved apiculus.

N. E. tropical Africa to Australia. Eastern plains, rare. October-December. *CJS* 15377, *HFP* 2420.

Note: The type variety has long lax cylindrical spikes giving it a strong superficial resemblance to *C. distans* L. f., var. *pseudonutans* Kueken.

Cyperus pangorei Rottboell, Descr. Pl. Rar. Programm. 18. 1772; Gamble, Fl. Madras 1641(1140). 1931; Kueken. in Engl., Pflanzenr. 101: 76. 1935.

Glaucous perennial. Rhizome stout, creeping, bearing dark fibrous scales. Stems to 120 cm. Leaves few, shorter than stems with long, papery, brown to purple sheaths. Inflorescence loose, rays 5-10; secondary bracts inconspicuous. Bracts leafy, equaling to much exceeding rays. Spikes broadly ovate with few, distant, erecto-patent spikelets. Spikelets linear, acute, red-brown, lax-flowered with a narrowly to broadly winged rachilla. Glumes elliptic, slightly incurved, distant with narrow keel and nerveless yellow to red-brown sides. Anther red-crested. Nut oblong, brown.

India, Sri Lanka. Common in marshes in the plains and on the rocky margins of streams in the Ghats. August-December. *CJS* 15716, *HFP* 2322, 2547.

Note: The species, as here described, is variable and may contain two taxa, a lowland and an upland one. Further study of a wide range of specimens is necessary to decide on what combination, if any, of small character differences holds throughout the range.

Cyperus pilosus Vahl, Enum. Pl. 2: 354. 1805; Gamble, Fl. Madras 1641(1140). 1931; Kueken. in Engl., Pflanzenr. 101: 92. 1935; Kern in Backer & Bakh. f., Fl. Java 3: 477. 1968.

Perennial with several slender rhizomes (stolons). Stems to 60 cm, acutely triquetrous, leafy below. Leaves gradually acuminate with long, papery golden sheaths. Inflorescence with few rays. Bracts leafy, much exceeding rays. Prophylls long, dark purple below. Spikes clustered, cylindrical; laterals spreading or reflexed with rachilla flexuose and hairy. Spikelets distant, spreading or reflexed, oblong, flat. Glumes distant, ovate, 2-2.5 mm long, obtuse and apiculate with sharp keel and 2-3-nerved, red-brown sides. Nut obovate-elliptic.

Tropical Asia, Australia. Common in open wet places in eastern plains and Ghats. May-November. *CJS* 13402, *HFP* 2296, 2471.

Cyperus pubisquama Steudel, Syn. Pl. Glum. 2: 20. 1854; Gamble, Fl. Madras 1639(1139). 1931. *Cyperus diffusus* Vahl var. *macrostachyus* Boeckeler, Linnaea 35: 534. 1868; Kern in Backer & Bakh. f., Fl. Java 3: 477. 1968.

Medium to stout leafy perennial. Stems sharply triangular, to 100 cm. Leaves flat, sharply acuminate, scabrid apically, with purple tinged sheath. Inflorescence to 40 cm across, 2-4×anthelate, outer rays spreading or reflexed; bracts leaf-like, much exceeding rays. Spikelets 1-4 together, narrowly oblong, somewhat compressed, to 30-flowered. Glumes closely and regularly imbricate, ovate to deltoid, subacute, mucronate with a clear green keel and brown nerveless sides. Nut elliptic.

Indomalaysia. Lower Ghats, in partial shade of semi-evergreen forest. July-December. *CJS* 14218, 15857, *HFP* 2447, 2454.

Cyperus pulchellus R. Brown, Prodr. 213. 1810; Kern, Reinwardtia 3: 39-46, f. 5. 1954. *Cyperus leucocephalus* auct. non Retzius, 1789; Gamble, Fl. Madras 1640(1140). 1931.

Small tufted perennial. Stems to 20 cm, bulbously thickened at the base. Leaves linear, sometimes exceeding stems; sheaths becoming fibrous. Inflorescence capitate, spherical, 5-10 mm across, white with 3 slender reflexed bracts. Spikelets numerous, sessile, confluent. Glumes lanceolate, about 2 mm, obtuse or subacute with an indistinct rounded keel. Nut narrowly elliptic, 0.75 mm.

Paleotropics. Eastern plains, in sandy soil in open, near water. October-November. *CJS* 15206, *HFP* 2223, 2551.

Cyperus rotundus L., Sp. Pl. 45. 1753; Gamble, Fl. Madras 1641(1140). 1931; Kueken. in Engl., Pflanzenr. 101: 107. 1935; Kern in Backer & Bakh. f., Fl. Java 3: 479. 1968.

Rhizomatous, tuberiferous perennial. Rhizomes many, slender (stolons). Stems leafy at the base, from a tuber. Leaves dark green above, paler beneath, gradually acuminate with reddish brown sheaths. Inflorescence of 3-9 spreading rays bearing tassels of few, large spikelets. Spikelets 20-40-flowered, red-brown to almost black. Glumes ovate to elliptic, subacute, apiculate, imbricate with 1-2 nerved sides and narrow hyaline margin. Not oblong-ovate.

Pantropics. In plains, as weed of cultivation. October-December. *HFP* 2390, 2396, 2419.

Note: Cyperus mitis Steud. is closely similar to *C. rotundus* in the arrangement and appearance of the spikelets, but is taller with long leaf sheaths, and has narrower spikelets (1 rather than 2 mm wide) and longer bracts. It occurs just outside the Hassan District and may be expected inside also.

Cyperus rubicundus Vahl, Enum. Pl. 2: 308. 1805. *Cyperus teneriffae* Poiret in Lamarck, Encycl. 7: 245. 1806; Gamble, Fl. Madras 1639(1139). 1931; Kueken. in Engl., Pflanzenr. 101: 306. 1935.

Small, tufted annual. Stems to 10 cm, ridged. Leaves linear, obtuse, shorter than to equaling stems with white, papery, inflated sheaths. Inflorescence of few, generally sessile spikelets. Spikelets oblong, 5-15 × 3-4 mm, obtuse, compressed, 20-30-flowered. Glumes broadly ovate to deltoid, acute, mucronate with a green keel and membranous, finely nerved, dark red-purple sides. Nut broadly elliptic, grey.

Africa, Madagascar, S. India. Eastern plains, amongst rocks in a dry deciduous forest area. November. *HFP* 2487.

Cyperus tenuiculmis Boeckeler, Linnaea 36: 286. 1870; Kern, Reinwardtia 3: 28-31. 1954 in Backer & Bakh. f., Fl. Java 3: 481. 1968. *Cyperus zollingeri* auct. non Steudel: Gamble, Fl. Madras 1641(1141). 1931; Kueken. in Engl., Pflanzenr. 101: 133. 1935.

Perennial with slender rhizomes (stolons). Stems to 50 cm, sharply triquetrous. Leaves rigid, gradually acuminate with papery, brownish sheaths. Inflorescence loose, open, bracts 3-4, erect with filiform tips; rays 4-10; spikes few-spikeletted. Spikelets elliptic, acute, compressed when young, quadrangular when mature, golden-yellow with a flexuose rachilla. Glumes ovate, suddenly acute and apiculate with a broad, green keel and two strong parallel nerves on the membranous side. Nut broadly elliptic, red-brown.

Paleotropics. Damp places in deciduous secondary forest in the eastern plains. August. *CJS* 14699.

Cyperus tenuispica Steudel, Syn. Pl. Glum. 2: 11. 1855; Gamble, Fl. Madras 1640(1139). 1931; Kueken. in Engl., Pflanzenr. 101: 245. 1935; Kern in Backer & Bakh. f., Fl. Java 3: 476. 1968. *Cyperus flavidus* auct. non Retzius: J. Hooker, Fl. Brit. India 6: 600. 1893.

Tufted annual. Roots fibrous, purple. Stems weak, 10-40 cm. Leaves all bladeless or one with trigonous blade. Bracts 1-3, the longest exceeding rays. Spikelets in dense clusters of 5-25, 4-10 mm long. Glumes oblong, about 0.8 mm long, purple-brown, incurved below, excurved above, spreading at maturity with a green midrib keeled above and obtuse membranous tip. Nut obtusely trigonous to rounded, stipitate, warty.

Paleotropics. Not uncommon weed of rice fields, easily confused with *C. haspan* L. ssp. *haspan.* October-November. *HFP* 2315, 2379, 2417 *b.*

DIPLACRUM R. Brown

Slender annuals. Stems with leaf-like bracts almost throughout. Spikelets unisexual, in sessile or shortly stalked axillary clusters. Female flowers terminal or apparently so, closely surrounded by two glumes which are often 3-toothed or 3-lobed and with air-containing tissue at the base. Nut tuberculate or longitudinally ridged, without basal cupule.

Note: The concept of the genus accepted here is that of S. T. Blake in *Journ. Arn. Arb.* 35: 234. 1954, i.e., the genus is restricted to a group of annual old-world species with a distinctive facies and two equal unwinged glumes immediately below the nut. Kern in *Blumea* 11: 144-146. 1961, argues the case for including these species in two adjacent terminal sections of the genus *Scleria,* to which *Diplacrum* is generally admitted to be close.

Diplacrum caricinum R. Br., Prodr. 241. 1810; C. B. Clarke, Ill. Cyper. t. 134, f. 3. 1909; Gamble, Fl. Madras 1678(1164). 1931. *Scleria caricina* (R. Br.) Bentham, Fl. Austral. 7: 426. 1878; J. Hooker, Fl. Brit. India 6: 688. 1893; Kern, Blumea 11: 208, f. 8e. 1961.

Glabrous. Roots reddish. Stems 5-35 cm. Leaves or bracts 3-5 mm wide. Female glumes 3-lobed, persistent, rigid, closely investing

the nut and shed with it. Nut depressed-globose, irregularly ribbed, grey-green when ripe.

Paleotropics from Sri Lanka, India eastwards. Occasional, in a small marsh in dry deciduous forest at Byra and in a damp abandoned field at Devalkere. October-November. *HFP* 2258, 2482.

ELEOCHARIS R. Brown

Stems often clustered, sometimes slenderly to stoutly rhizomatous. Leaf-blades reduced to a triangular point or mucro. Inflorescence a single terminal spikelet with glume-like bract. Flowers bisexual, often with retrorsely scabrid bristles surrounding the ovary and falling with the nut. Base of the style expanded, hardened, persistent on the generally obovate nut. Stigmas 2 or 3. Embryo fimbristyloid. Anatomy chlorocyperoid.

1 Spikelet at least 15 mm long.
2 Stem transversely septate, articulate (at least when dry).....*E. dulcis*
2 Stem not septate.....*E. acutangula*
1 Spikelet up to 10 mm long.
3 Glumes few, distichous at least at base of spikelet. Stems capillary.....*E. retroflexa* ssp. *chaetaria*
3 Glumes many, spiral. Stems at least 0.5 mm wide.
4 Nut yellow-green, exceeded by its 7 bristles.....*E. congesta*
4 Nut black.
5 Nut 0.75 mm long, with 4 (6) white bristles shorter than itself.....*E. atropurpurea*
5 Nut 1.0 mm long or more, with 5-7 pink bristles.....*E. geniculata*

Eleocharis acutangula (Roxb.) J. A. Schultes, Mant. 2: 91. 1824; Kern in Backer & Bakh. f., Fl. Java 3: 461. 1968. *Scirpus fistulosus* Poir, 1804 non Forsk. 1775. *Scirpus acutangulus* Roxb., Fl. Ind. 1: 216. 1820. *Eleocharis fistulosa* Schultes, Mant. 2: 89. 1824; J. Hooker, Fl. Brit. India 6: 626. 1893; Gamble, Fl. Madras 1648 (1145). 1931.

Perennial with creeping rhizome. Stems to 50 cm×4 mm, sharply triquetrous. Sheaths membranous, brown, tinged purple. Spikelet cylindric, about 30×4 mm, terete, acute. Glumes ovate, firm, striate, subacute with a clear membranous margin. Bristles 6-7 retrorsely scabrous, one short, others equaling or exceeding nut. Nut urceolate, biconvex, vertically striate. Style base triangular.

Pantropics. Not uncommon in marshes and at pond margins in plains. June-November. *CJS* 13933, *HFP* 228.

Eleocharis atropurpurea (Retzius) K. B. Presl, Rel. Haenk. 1: 196. 1828; Gamble, Fl. Madras 1648(1145). 1931; Svenson, Rhodora 31: 227, f. 49. 1929; Kern in Backer & Bakh. f., Fl. Java 3: 461.

1968. *Scirpus atropurpureus* Retzius, Obs. 5: 14. 1789. *Eleogenus atropurpureus* Nees in Wight, Contr. Bot. India 113. 1834.

Annual. Stems 2-8 cm, slender, ridged. Sheath apex membranous, apiculate. Spikelet ovoid-ellipsoid, 2.5-4×2-2.5 mm, angled, obtuse. Glume ovate-oblong, 1.25×0.6 mm, obtuse, loosely imbricate with a wide hyaline margin and raised green midrib. Bristles 4, white, retrorsely scabrid, shorter than the nut. Nut broadly obovate-orbicular, 0.75 mm long. Style base small, triangular, white.

Pantropics & into S. Europe. Occasional in the plains in wet open places. November-December. *HFP* 1121, 2555.

Eleocharis congesta D. Don, Prodr. Fl. Nepal. 41. 1825; J. Hooker, Fl. Brit. India 6: 630. 1893; Gamble, Fl. Madras 1648(1145). 1931; Kern in Backer & Bakh. f., Fl. Java 3: 461. 1968. *Eleocharis afflata* Steudel, Syn. Pl. Glum. 2: 76. 1855; J. Hooker, Fl. Brit. India 6: 629. 1893.

Annual or perennial. Stems 7-35 cm, about 1 mm wide, angular, ridged. Sheath apex truncate, apiculate. Spikelet oblong 5-8×2.5-4 mm, terete, subacute, purplish, often proliferous. Glumes loosely imbricate, oblong, 1.5-2 mm long, thin, obtuse with a green midrib disappearing in the membranous margin. Stigmas 3. Nut oblong-obovate 1.5 mm long, yellow-green. Bristles 7, white or brown, exceeding the nut and style base. Style base conical, 1/3-1/2 as wide as nut.

India to Japan, Malaysia. Common in Ghats, in damp sandy places and rice fields. October-January. *HFP* 1302, 2290.

Eleocharis dulcis (N. Burman) Henschel, Vita Rumph. 186. 1833; Kern in Backer & Bakh. f., Fl. Java 3: 460. 1968. *Andropogon dulcis* N. Burman, Fl. Ind. 219. 1768. *Scirpus plantagineus* Retz., Obs. 5: 14. 1789. *Eleocharis plantaginea* (Retz.) Roemer & Schultes, Syst. 2: 150. 1817; J. Hooker, Fl. Brit. India 6: 625. 1893; Gamble, Fl. Madras 1647(1145). 1931. *Eleocharis equisetina* Presl, Rel. Haenk. 1: 195. 1828; J. Hooker, Fl. Brit. India 6: 626. 1893.

Robust, stoloniferous, tuberiferous perennial. Stems to 80 cm×8 mm, terete, spongy, transversely septate. Sheath apex triangular, red-spotted. Spikelet cylindric, to 40 mm long, as wide as stem, terete, yellowish-green. Glumes oblong, obtuse, firm with a narrow raised mid-rib and hyaline margin. Bristles 6-8, generally exceeding nut. Anther connective with a long, apiculate crest. Nut obovoid, biconvex, smooth, shining. Style base triangular, dark brown, about 1/2 width of nut.

Paleotropics. Rare, eastern plains at Hassan and Byra, 'Chinese Water Chestnut.' The tubers are edible. April. *CJS* 9527, 13695.

Eleocharis geniculata (L.) Roemer & Schultes, Syst. 2: 150. 1817;

Kern in Backer & Bakh. f., Fl. Java 3: 461. 1968. *Scirpus geniculatus* L., Sp. Pl. 48. 1753. *Eleocharis capitata* R. Br., Prodr. 225. 1810; Gamble, Fl. Madras 648(1145). 1931; non *Scirpus capitatus* L., 1753.

Tufted or slenderly rhizomatous, annual. Stems to 30 cm, about 1 mm wide, rather rigid, angular, ridged. Leaf-sheaths truncate, with a triangular membranous tip. Spikelet globose to obovoid, about 4.5 × 3 mm, obtuse. Bract up to 1/2 spikelet length. Glume elliptical 1.5-2.0 × 1.2-1.4 mm, membranous with a broad, diffuse keel. Stigmas plumose-papillate. Bristles 5-7, shorter to slightly longer than the nut. Nut narrowly obovate, about 1.0 mm long, black. Style base 1/3-1/2 as wide as nut, conical.

Pantropics. Common in marshy places including rice fields on plains. May-November. *CJS* 13566, *HFP* 2241.

Note: Bristles in this species are generally described as exceeding the nut. The short and generally few bristled examples found particularly as a rice-field weed in Hassan require further investigation.

Eleocharis retroflexa (Poir.) Urban, Symb. Ant. 2: 165. 1900; Kern in Backer & Bakh. f., Fl. Java 3: 460. 1968. *Scirpus retroflexus* Poir. in Lamarck, Encycl. 6: 753. 1804.

ssp. **chaetaria** (Roemer & Schultes) Koyama, Bull. Nat. Sci. Mus. Tokyo 17: 68. 1974. *Eleocharis chaetaria* Roemer & Schultes, Syst. 2: 154. 1817; Gamble, Fl. Madras 1648(1145). 1931; Svenson, Rhodora 39: 250, t. 461, f. 10. 1937.

Tufted, fibrous rooted annuals. Stems 2-20 cm, slender, often recurved, sometimes submerged and then elongated, weak and proliferous rather than fertile. Leaf-sheath inconspicuous, often purple, with an inflated, membranous, oblique mouth. Spikelet elliptical, acute, becoming obovate, obtuse, 2-3 × 1-2 mm, compressed. Glumes few, the lower distichous, ovate, obtuse, membranous, purple-tinged with a narrow green midrib. Bristles 6, unequal, only the longest equaling the nut. Nut obovate, about 1.2 mm long, truncate, trigonous with ridged angles, surface cancellate with rows of hexagonal cells. Style base as wide as nut, deeply 3-lobed on the nut angles, shortly pyramidal.

Indomalaysia. Not uncommon in Ghats in shallow water or on wet soil. October-November. *HFP* 2479, 2484.

Note: Svenson distinguishes the Asiatic species *E. chaetaria* Roem. & Schultes by a lower and blunter style base and larger and deeper cells on the nut from the New World *E. retroflexa* (Poir.) Urban. Kern united the taxa but Koyama finds that the small morphological differences are consistently correlated with provenance.

FIMBRISTYLIS Vahl *nom. cons.*

Generally tufted. Ligule a fringe of hairs or absent. Glumes several,

spiral or when young distichous, lowest 1-3 sterile, deciduous. Rachilla often winged. Flowers bisexual, or the uppermost male or wanting. Perianth absent. Style more or less expanded below (style base), caducous at an articulation with the ovary. Stigmas 2 or 3. Nut variously patterned, sometimes stalked (gynophore). Anatomy chlorocyperoid. Embryo fimbristyloid or rarely bulbostyloid.

Note: Measurements given for the style include the style base but not the stigmas.

1 Spikelets 1-2.
2 Lower glumes distichous.....*F. ovata*
2 Lower glumes spiral.
3 Glumes obtuse; mid-rib not excurrent.....*F. tetragona*
3 Glumes apiculate.
4 Nut fine striated with rows of isodiametric cells.....*F. schoenoides*
4 Nut rugulose with transverse wavy ridges.....*F. acuminata*
1 Spikelets many.
5 All spikelets sessile.....*F. argentea*
5 All spikelets not sessile.
6 Nut oblong-cylindrical, with clavate outgrowths.....*F. dipsacea*
6 Nut not oblong-cylindrical, without clavate outgrowths.
7 Nut trigonous; stigmas 3.
8 Lower glumes distichous.
9 Glumes with red glands.....*F. cinnamometorum*
9 Glumes without red glands.....*F. eragrostis*
8 All glumes spiral.
10 Ligule of dense hairs present.....*F. complanata*
10 Ligule absent.
11 Creeping, fiber-covered rhizome present.....*F. falcata*
11 Creeping, fiber-covered rhizome absent.
12 Cauline leaves well-developed.
13 Nut with transversely elongated cells.....*F. woodrowii*
13 Nut with isodiametric, occasionally inflated cells.....*F. tenera*
12 Cauline leaves on fertile shoots reduced to sheaths.
14 Stem rhizomatous; rachilla winged.....*F. aphylla*
14 Stem tufted; rachilla wingless.....*F. miliacea*
7 Nut lenticular; stigmas 2.
15 Ligule present, membranous or a fringe of hairs.
16 Glumes hairy on upper half; nut faintly striolate.
17 Nut distinctly stipitate.....*F. sieberiana*
17 Nut hardly stipitate.....*F. ferruginea*
16 Glumes glabrous; nut vertically ridged.
18 Ridges on nut 5-10.
19 Spikelets 1-1.5 mm wide.....*F. bisumbellata*
19 Spikelets 2-4 mm wide.....*F. dichotoma*
18 Ridges on nut 12-24.
20 Nut verruculose.....*F. alboviridis*
20 Nut not verruculose.....*F. podocarpa*
15 Ligule absent.
21 Style-base with decurved long hairs.....*F. squarrosa*
21 Style-base papillose, without decurved hairs.....*F. aestivalis*

Fimbristylis acuminata Vahl, Enum. Pl. 2: 285. 1805; Gamble, Fl. Madras 1658(1150). 1931; Kern in Backer & Bakh. f., Fl. Java 3: 464. 1968.

Caespitose. Stems to 15 cm × 1 mm, terete, ridged. Leaves 2; sheath inflated at apex; blade triangular. Ligule none. Inflorescence of 1 terminal spikelet. Spikelet 10×3.5 mm, ovate, acute. Glume ovate-elliptic, 3.75×2.5 mm, chestnut brown above, rounded; midrib ridged above, excurrent in an obtuse apiculus. Styles 2. Nut ovate-orbicular, 1.75 mm long, compressed, coarsely rugulose with transverse wavy ridges.

Indomalaysia extending to Philippines. At Byra in western plains in marshy ground. October. *HFP* 2254. 2316.

Fimbristylis aestivalis (Retzius) Vahl, Enum. Pl. 2: 288. 1805; J. Hooker, Fl. Brit. India 6: 637. 1893. *Scirpus aestivalis* Retzius, Obs. 4: 12. 1786.

Tufted annual. Stems 5-30 cm, angular, ridged. Leaves pubescent, eligulate; sheath red-brown, membranous. Inflorescence twice anthelate. Spikelets few, solitary, oblong, about 4×1.5 mm. Glumes 1.5 mm, spreading, with raised excurrent green keel and brown membranous nerveless sides; lower glumes and bracts pubescent. Stamen 1; anther 0.4 mm. Style 0.5 mm, flattened, wide, fimbriate at the base of the stigmas; style base expanded, papillate. Nut broadly elliptical, compressed, stramineous, semi-transparent, bordered, faintly patterned by the isodiametric surface cells.

S & E Asia, Malaysia, tropical Australia. Scattered throughout in open, marshy or damp places. January-April. *CJS* 13075, 16928, *HFP* 1257.

Fimbristylis alboviridis C. B. Clarke in J. Hooker, Fl. Brit. India 6: 638. 1893; Kern in Backer & Bakh. f., Fl. Java 3: 466. 1968.

Annual. Stems to 15 cm, stiff. Leaves grey-green, ligulate; sheath hairy. Inflorescence once anthelate, small. Spikelets solitary, few, ovate, about 4×2.5 mm. Glumes broadly ovate to suborbicular, about 2 mm long, pale or greenish stramineous, tinged brown on the nerveless sides. Nut obovoid-orbicular, compressed, patterned with about 18 rows of elongate-hexagonal cells, warty toward the margin.

Old World Tropics. Rare or overlooked, edge of pool in dry deciduous forest at Bourdalboore. October. *HFP* 2346 B.

Fimbristylis aphylla Steudel, Syn. Pl. Glum. 2: 114. 1855; Kern, Blumea 8: 117. 1955. *Fimbristylis quinquangularis* (Vahl) Kunth var. *crassa* C. B. Clarke in J. Hooker, Fl. Brit. India 6: 644. 1893; Gamble, Fl. Madras 1659(1151). 1931.

Perennial with short creeping rhizome. Stems to 60 cm, ridged,

4-5 angled, bearing bladeless sheaths. Leaves on sterile shoots stiff, about 4 mm wide, eligulate. Inflorescence 3 × anthelate; rays slender, to 10 cm; bracts very short. Spikelets solitary, oblong-elliptic, about 5×2.5 mm, obtuse. Glumes obovate, about 1.5 mm long, dark with a 3-nerved, wide keel and pale, membranous margin. Stamens 3. Style 0.75 mm, hairy at the base of the 3 stigmas; base narrow, trigonous. Nut obtusely trigonous with one rounded angle, about 0.7×0.6 mm; surface cells much elongated transversely, in vertical rows, some inflated to give an irregularly warty surface.

Tropical & S. Africa, India, Java, Sumatra. Marshy area near paddy fields in upper Ghats. October, November. *HFP* 2298, 2483.

Note: Kern (*l.c.*) notes that *F. aphylla* has 1-2 stamens whilst the allied *F. salbundia* (Nees) Kunth has (2) 3. Our specimens have (2) 3 stamens but lack the distinctly raised dark keel of *salbundia* and further differ from it in that the cells of the nut are several times longer than broad.

Fimbristylis argentea (Rottboell) Vahl, Enum. Pl. 2: 294. 1805; Gamble, Fl. Madras 1659(1151). 1931. *Scirpus argenteus* Rottboell, Programm. 27. 1772.

Annual with white, fibrous roots. Stems to 8 cm×0.5 mm. Leaves shorter to equaling stems with red dotted sheaths, ciliate on the mid-rib. Inflorescence a capitate cluster of sessile spikelets about 1 cm across. Glumes numerous, triangular-ovate, about 1.2 mm long, membranous with a green herbaceous keel. Style 0.5 mm, smooth. Stigmas 2, feathery. Nut like that of *F. aestivalis*.

Indomalaysia, ? Mauritius. Frequent on the drying edges of open water in the eastern plains. November, December. *CJS* 16054, *HFP* 2388, 2554.

Fimbristylis bisumbellata (Forskal) Bub., Dodec. 30. 1850; Gamble, Fl. Madras 1658(1151). 1931. *Scirpus bisumbellatus* Forskal, Fl. Aeg.-Arab. 1: 15. 1775. *Fimbristylis dichotoma* auct. non Vahl: J. Hooker, Fl. Brit. India 6: 635. 1893.

Caespitose annual. Stems 10 cm×1.25 cm, flattened. Leaf flat with several equal nerves; ligule a fringe of short hairs; sheath membranous, hairy. Inflorescence of numerous oblong spikelets. Rachilla much elongating. Bracts hairy at base. Glumes ovate-oblong, 1.2 mm, membranous, red-brown, with green, sharp, apiculate keel. Style fimbriate. Stigmas 2. Nut obovate 0.5×0.45 mm, ridged with 7 rows of cells; outer layer transparent.

Paleotropics extending to temperate regions. Throughout the region in open damp sandy areas. November-April. *CJS* 13079, *HFP* 1522, 2410.

Fimbristylis cinnamometorum (Vahl) Kunth, Enum. Pl. 2: 229.

1837; Kern, Blumea 8: 123. 1955. *Scirpus cinnamometorum* Vahl, Enum. Pl. 2: 278. 1805. *Fimbristylis cyperoides* R. Br. var. *cinnamometorum* (Vahl) C. B. Clarke in J. Hooker, Fl. Brit. India 6: 650. 1893; Gamble, Fl. Madras 1659(1151). 1931.

Perennial, tufted or shortly rhizomatous. Stems to 50 cm. Leaves filiform, numerous. Inflorescence of many rayed spikelets. Glumes ovate, 2.75-4 mm, acuminate with chestnut gland-dotted nerveless sides; lowermost smaller, sterile. Style 3 mm. Stigmas 3. Stamens 3; anther 1.5 mm. Nut obovate-elliptic, 0.75-1.0 × 0.4-0.7 mm, vertically ridged by about 7 rows of transversely elongated cells.

Indomalaysia to N. Australia. In open marshy areas of dry deciduous forest in western plains. October. *HFP* 1022, 2263, 2285.

Fimbristylis complanata (Retzius) Link, Hort. Bot. Berol. 1: 292. 1827; Gamble, Fl. Madras 1659(1151). 1931. *Scirpus complanatus* Retzius, Obs. 5: 14. 1789.

Densely caespitose, glaucous perennial with flattened shoots. Stems to 45 cm × 2.5 mm, flattened above. Leaves constricted above half way up with a thickened spinulose margin and abruptly triangular apex. Sheath compressed, asymmetrically keeled; ligule a line of hairs. Inflorescence twice anthelate with numerous stalked spikelets. Bract erect. Spikelets linear to narrowly elliptical, 7 × 1-1.5 mm, angular, red-brown, somewhat contorted. Glumes elliptical, 2.5 × 1.5 mm, shortly hispid with entire margin, nerveless sides and slender apiculate keel. Anther 1 mm. Nut obovoid, 0.65-0.75 × 0.5 mm, grey, obtusely trigonous, inflated, verrucose.

Pantropical. Eastern plains; a weed of cultivated or disturbed ground. August-November. *CJS* 14273, *HFP* 2378.

Note: Close to the New World *F. autumnalis* (L.) Roem. & Schultes which, however is annual and has much shorter anthers.

Fimbristylis dichotoma (L.) Vahl, Enum. Pl. 2: 287. 1805. *Scirpus dichotomus* L., Sp. Pl. 1: 50. 1753. *Scirpus diphyllus* Retzius, Obs. 5: 15. 1789. *Fimbristylis diphylla* (Retzius) Vahl, Enum. Pl. 2: 289. 1805; J. Hooker, Fl. Brit. India 6: 636. 1893. *Fimbristylis annua* Roem. & Schultes, var. *diphylla* Kueken.; Gamble, Fl. Madras 1658 (1151). 1931.

Shortly rhizomatous or caespitose, variable perennial. Stems 12-40 cm. Leaves flat, with a rounded spinulose tip; sheath hairy, brown spotted. Ligule hairy. Spikelets solitary, few, ovate, acute, about 5.6 × 2.5 mm, red-brown. Glumes broadly ovate, brown, minutely apiculate. Style about 1 mm, bearded at the base of the 2 stigmas. Nut obovate or broadly elliptical, 0.9-1.1 × 0.6-0.8 mm, ridged by 7-10 rows of concave thick-walled cells.

Tropics & subtropics. Common throughout, in open damp marshy places or by streams. June-November. *CJS* 13895, 15342, *HFP* 2193, 2440, 2448.

Fimbristylis dipsacea (Rottboell) C. B. Clarke in J. Hooker, Fl. Brit. India 6: 635. 1893; Gamble, Fl. Madras 1658(1151). 1931. *Scirpus dipsaceus* Rottboell, Descr. Ic. Pl. 56, t. 12, f. 1. 1773.

Dwarf annual. Stems to 3 cm. Leaves few, capillary. Inflorescence sometimes sessile and basal, or simply and shortly anthelate. Spikelets solitary, subglobose, echinate, greenish. Glumes lanceolate with thin nerved sides and long spinulose acumen. Stamen 1. Nut elliptical, 0.6 mm long, terete, faintly striolate with stipitate globose outgrowths ('glands').

Paleotropics. Rare, in an open marshy area at Vishnu Samudra, Belur. May. *CJS* 13530A.

Fimbristylis eragrostis (Nees) Hance, Journ. Linn. Soc., Bot. 13: 132. 1873; Kern, Reinwardtia 6: 41. 1961. *Abildgaardia eragrostis* Nees & Meyen ex Nees in Wight, Contr. Bot. India 95. 1834.

var. **nigrobrunnea** (Thwaites) Hooper *comb. nov.* *Fimbristylis nigrobrunnea* Thwaites, Enum. Pl. Zeyl. 434. 1864; Gamble, Fl. Madras 1659 (1151). 1931.

Rhizomatous. Stems to 30 cm, ridged, flattened and scabrid above. Leaves 3 mm wide, flat, truncate, eligulate, spreading. Inflorescence 1-2 × anthelate; bract very short. Spikelets oblong-ovate, about 8×2.5 mm. Glumes triangular-ovate, acute, apiculate, dark shining brown with a green, shortly excurrent keel. Style 2 mm, trigonous. Nut obovate, 1×0.75 mm, trigonous, pale with a faint surface pattern of isodiametric cells.

Indomalaysia. Uncommon, on loose sandy soil in a wet deciduous forest at Vanagur in upper Ghats. October. *CJS* 17829.

Fimbristylis falcata (Vahl) Kunth, Enum. 2: 239. 1837; Kern, Blumea 8: 113. 1955. *Scirpus falcatus* Vahl, Enum. Pl. 2: 275. 1805. *Trichostylis junciformis* Nees in Wight, Contrib. Bot. India 106. 1834. *Fimbristylis junciformis* (Nees) Kunth, Enum. 2: 239. 1837; Gamble, Fl. Madras 1660(1152). 1931.

Perennial with a short, creeping, fiber-covered rhizome. Leaves spreading, eligulate, abruptly triangular tipped. Inflorescence sessile or once anthelate with few rays. Spikelets elliptic. Glumes obtuse red-brown with a white margin. Nut 1-2 mm, trigonous, pale; surface cells quadrate, nearly isodiametric, some convex, producing an irregularly papillate-verruculose surface.

Indomalaysia, Madagascar. Locally common in western plains near Belur. May. *CJS* 13512.

Note: The species typically has a once to twice anthelate inflorescence with some spikelets solitary or paired. Our specimen has an exceptional contracted inflorescence, most closely approached by a Nilgiri collection.

Fimbristylis ferruginea (L.) Vahl, Enum. Pl. 2: 291. 1805; Gamble, Fl. Madras 1658(1151). 1931; Kern in Backer & Bakh. f., Fl. Java 3: 465. 1968. *Scirpus ferrugineus* L., Sp. Pl. 50. 1753.

Shortly rhizomatous or tufted perennial. Lower sheaths coriaceous, bladeless; upper with membranous, gland-dotted, ciliate face and short, rigid blade. Spikelets few, clustered or shortly stalked, elliptic, about 10 × 3.5 mm, acute. Glumes ovate, obtuse, apiculate, red-brown, shortly hairy in the upper part. Style 3 × 0.25 mm. Stigmas 2. Nut obovate, about 1.25 × 0.85 mm, faintly striolate.

Pantropics. In marshy open area near Addahalla in eastern plains. November. *HFP* 2399.

Note: Close to *F. sieberiana* Kunth but distinguished by the reduced leaves, thicker sheaths, longer, narrow style and smaller, non-stipitate nut.

Fimbristylis miliacea (L.) Vahl, Enum. Pl. 2: 287. 1805; Gamble, Fl. Madras 1660(1152). 1931; Kern in Backer & Bakh. f., Fl. Java 3: 463. 1968. *Scirpus miliaceus* L., Syst. Veg. ed. 10, 868. 1759 (see note). *Fimbristylis littoralis* Gaudichaud in Freycinet, Voy. Bot. 413. 1826.

Tufted annual or perennial. Axillary stems to 60 cm, quadrangular, bearing bladeless, papery sheath. Leaves on terminal sterile shoot equitant, eligulate. Inflorescence 3-4 × anthelate. Spikelets subglobose, dark reddish-brown. Glumes ovate, obtuse, rounded on back. Style 0.8 mm. Stigmas 3. Nut narrowly obovate, about 0.55 × 0.5 mm, verruculose.

Pantropics. Common as rice-field weed and in other marshy open places in plains. October-November. *CJS* 15674, *HFP* 2287, 2510.

Note: We follow Kern, Kral and others in considering it permissible to choose a lectotype from the two specimens in the Linnean herbarium so as to confirm the use of this epithet in the traditional sense.

Fimbristylis ovata (N. Burman) Kern, Blumea 15: 126. 1967. *Carex ovata* N. Burman, Fl. Ind. 194. 1768. *Cyperus macrostachyos* L., Mant. Alt. 180. 1771. *Fimbristylis monostachyos* (L.) Hasskarl, Pl. Jav. Rar. 61. 1848; J. Hooker, Fl. Brit. India 6: 649. 1893; Gamble, Fl. Madras 1660(1152). 1931. *Abildgaardia ovata* (N. Burman) Kral, Sida 4: 72. 1971.

Shortly rhizomatous perennial. Stems to 20 cm, thickened at the base. Leaves linear, shorter than stems. Inflorescence of 1-2(3) solitary spikelets; bract very short. Spikelets narrowly ovate, about 10 × 3 mm, acute. Glumes triangular-ovate, acute with pale scarious sides and curved green, shortly excurrent keel. Style smooth. Nut stipitate-orbicular, 2 × 1.75

mm, terete or somewhat ridged, covered by large warts except on the ridges.

Pantropics. Occasional throughout in marshy ground. September-October. *CJS* 17885, *HFP* 2356.

Note: This is the type species of the genus *Abildgaardia* Vahl. which has been variously regarded 1) as an independent genus because, mainly, of the distichous arrangement of the glumes, 2) as a section of *Fimbristylis* because of the deciduous style base, or 3) recently by Lye (*Bot. Notiser* 126: 325. 1973) as conspecific with *Bulbostylis* because of the resemblance in embryo type recorded by Van der Veken (*l.c.*). The latter showed however, that arrangement of the glumes was not correlated with embryo type in *Fimbristylis* s.l. Until further study has established useful character correlations the most practical division remains that based on style base dehiscence, under which *Abildgaardia* goes with *Fimbristylis*.

Fimbristylis podocarpa Nees & Meyen ex Nees in Wight, Contr. Bot. India 98: 1834 *pro parte typica*; J. Hooker, Fl. Brit. India 6: 638. 1893.

Perennial. Stems stiff, to 50 cm. Leaves ligulate, obtuse, sheath hairy at top. Inflorescence 2×anthelate; rays spreading; bracts short. Spikelets ovate, acute, about 6×2.5 mm, terete. Glumes broadly ovate or orbicular, chestnut with a narrow pale keel. Stamens 2. Style flat, fimbriate. Stigmas 2. Nut orbicular flattened, about 1.3×1.00 mm with a conspicuous gynophore, striate with about 18 rows of hexagonal nearly isodiametric cells.

Indomalaysia. Rare, in a marshy area in semi-evergreen forest on lower Ghats. October. *HFP* 2336A.

Fimbristylis schoenoides (Retzius) Vahl, Enum. Pl. 2: 286. 1805; Gamble, Fl. Madras 1658(1150). 1931. *Scirpus schoenoides* Retzius, Obs. 5: 14. 1789.

Perennial. Stems to 30 cm. Leaves glaucous, ligulate, blunt; sheath brown, membranous, inflated above. Inflorescence of 1-2 spikelets; bract erect. Spikelets broadly ovate to orbicular, about 6.0×4.0 mm. Glumes very broadly ovate, obtuse, apiculate, rounded on back. Style 0.6 mm. Stigmas 2. Nut elliptic, about 1.75×1.1 mm, flattened, finely striate with rows of isodiametric cells.

India to tropical Australia. In plains, in marshes and at edge of open water. October. *CJS* 15232, *HFP* 2259, 2350.

Fimbristylis sieberiana Kunth, Enum. 2: 237. 1837; Kern, Blumea 8: 131. 1955. *Fimbristylis ferruginea* (L.) Vahl var. *sieberiana* (Kunth) Boeck., Linnaea 37: 17. 1871.

Shortly rhizomatous perennial. Stems to 40 cm. Leaves glaucous, ligulate; sheath membranous, red-dotted, sparsely pubescent. Inflorescence once anthelate; bract erect, exceeding rays. Spikelets ovate, about 10×4 mm. Glumes broadly ovate, obtuse, apiculate, dark brown, tomentose apically. Nut broadly obovate to orbicular, about 1.8×1.4 mm, stipitate, faintly striolate.

Paleotropics. A weed of rice fields and other open marshy places in plains. August-November. *CJS* 14278, *HFP* 2372.

Note: Close to *F. ferruginea* but with long leaves and a larger, stipitate nut.

Fimbristylis squarrosa Vahl, Enum. Pl. 2: 289. 1805; J. Hooker, Fl. Brit. India 6: 635. 1893.

var. **esquarrosa** Makino, Bot. Mag. Tokyo 17: 47. 1903. *Fimbristylis squarrosa* Vahl var. *velata* (R. Br.) C. B. Clarke. *Fimbristylis velata* R. Br., Prodr. 227. 1810; Govindarajulu, Reinwardtia 8: 509. 1974.

Annual. Stem 2-25 cm. Leaves filiform, ligulate, pubescent. Inflorescence 1-2×anthelate. Spikelets lanceolate-cylindric, angular, acute. Glumes ovate with sharp excurrent keel, brown, with membranous margin. Style hairy especially toward the base of 2 stigmas, with long decurved hairs on style-base. Nut lenticular, about 0.7×0.6 mm with a transparent pericarp.

Pantropics & into subtropics. Upper Ghats, in marshes at Hebbsale. February. *CJS* 16450.

Note: Examination of specimens of *F. squarrosa* extending over the whole of its range shows that the length of the glume acumen incompletely defines two entities and that the other characters mentioned by Govindarajulu (*l.c.*) as separating *F. squarrosa* and *F. velata* are also variable and incompletely correlated with glume apex length. No distributional separation of the two varieties appears possible except that at the western extreme of the range var. *squarrosa* occurs alone and at the eastern var. *esquarrosa.*

Fimbristylis tenera J. A. Schultes, Mant. 2: 57. 1824; Gamble, Fl. Madras 1669(1152). 1931.

var. **oxylepis** (Steud.) C. B. Clarke in J. Hooker, Fl. Brit. India 6: 642. 1893. *Fimbristylis oxylepis* Steudel, Syn. Pl. Glum. 2: 110. 1855.

Slender annual. Stems 4-5 angled, ridged, scabrid. Inflorescence 1-2 anthelate with solitary to rather few spikelets. Spikelets lanceolate, terete, acute. Glumes ovate, 2.5 mm long, acute, apiculate, glandular-papillate, minutely ciliate on the narrow, membranous margin with a sharp, scabrid green keel. Style 1.5 mm, base trigonous, spongy. Nut obovate, very obtusely trigonous, with quadrate or hexagonal, more or less isodiametric cells in irregular rows, some inflated.

India, Sri Lanka. Not uncommon on damp sandy soil by open water in plains. October-November. *HFP* 2251, 2553.

Note: This species appears to belong to a paleotropic complex, including the African *F. scabrida* Schumach., which requires further investigation. The above name is therefore tentative.

Fimbristylis tetragona R. Br., Prodr. 226. 1810; Gamble, Fl. Madras 1658(1150). 1931; Kern in Backer & Bakh. f., Fl. Java 3: 462. 1968.

Perennial. Stems to 50 cm, quadrangular. Leaves bladeless; sheaths with oblique inflated mouths. Inflorescence *Eleocharis*-like. Glumes

oblong-ovate, obtuse, rounded on the back, several nerved. Style base hairy. Stigmas 2-3. Nut pale, narrowly obovate or cylindric, trabeculate, with a conspicuous gynophore.

India to tropical Australia. Not uncommon in open marshy places in the dry deciduous forest area of plains. October-November. *CJS* 15673, *HFP* 2229, 2253.

Fimbristylis woodrowii C. B. Clarke in Bull. Misc. Inf. 227. 1898. (*woodrowi*).

Densely tufted. Stems to 15 cm, flattened. Leaves flat, eligulate, obtuse. Inflorescence a cluster of sessile and short stalked spikelets. Spikelets linear-lanceolate, about 3×1 mm, angular. Glumes ovate, acute, about 1.3 mm long with a sharp, curved, minutely excurrent keel, brown sides and membranous margin. Stamen 1. Stigma 0.75 mm with a white, spongy, trigonous style base. Nut obovate, 0.6×0.4 mm, obtusely trigonous with about 4 rows of transversely elongate cells on each face.

Deccan. Not uncommon in sandy, open, seasonally wet places in upper Ghats. September-November. *CJS* 14746, *HFP* 2441, 2480.

Fimbristylis sp. aff. *F. microcarpa*

Annual. Leaves with purplish-brown sheaths. Inflorescence narrow with solitary spikelets. Spikelets linear, angular, acute. Glumes triangular-ovate, obtuse with broad, membranous margin and raised, rounded keel. Style 0.75 mm. Stigmas 3. Nut 0.75×0.4 mm, trigonous with transparent, finely striate, sparsely warty surface.

Indomalaysia. Uncommon, by roadside in wet soil in semi-evergreen forest of lower Ghats. October. *HFP* 2333.

FUIRENA Rottboell

Stems leafy to above the middle. Leaves distant, lanceolate or linear-lanceolate, flat, with a membranous, collar-like ligule. Inflorescence of clustered spikelets in terminal and axillary, stalked and generally branched, partial panicles; bracts leaf-like, reducing in size upwards. Spikelets more or less ellipsoid and usually grey-green becoming reddish-brown. Rachilla unwinged, with vertically elongated pits. Glumes spirally arranged, pubescent or hispid at least in the upper part, aristate or mucronate. Flowers bisexual. One or two whorls of hypogynous structures present; outer whorl (opposite the angles of the nut) of 3 (rarely 4) retrorsely-scabrid bristles or wanting; inner whorl (opposite the faces of the nut) of 3 variously-shaped, characteristically 3-veined scales or simple bristles. Stamens 3. Stigmas 3. Nut more or less elliptical, trigonous narrowed into a stalk below and a beak above.

1 Perennial, with a creeping rhizome. Leaves with 3 or 5 main veins.
2 Stems 3-sided, up to 4 mm across. Leaves 3-veined. Nut striate with clear rows of surface cells, surrounded by 3 short bristles.....*F. wallichiana*
2 Stems 5-sided, up to 8 mm across. Leaves 5- or 7-veined.....*F. umbellata*
1 Annual, tufted or shortly rhizomatous. Leaves with many subequal veins.
3 Glumes few per spikelet, each with a stout, recurved, apical acumen.....*F. uncinata*
3 Glumes many per spikelet, each with a ciliate subapical arista.
4 Tips of the hypogynous scales quadrate, with wavy lateral wings produced downward in rounded points.....*F. ciliaris*
4 Tips of the hypogynous scales anchor-shaped, without lateral wings.....*F. trilobites*

Fuirena ciliaris (L.) Roxb., Fl. Ind. 1: 184. 1820; Kern in Backer & Bakh. f., Fl. Java 3: 457. 1968; Vartak, J. Univ. Poona Sci. & Tech. Sect. 40: 198. 1971. *Scirpus ciliaris* L., Mant. Alt. 182. 1771. *Fuirena glomerata* auct. non Lamarck, 1791: C. B. Clarke, Ill. Cyper. t. 59, f. 6. 1909; Gamble, Fl. Madras 1669(1158). 1931.

Annual. Stem 15-40 cm, terete or with rounded angles, 2-3 mm wide. Leaves with hispid sheaths. Inflorescence often with 2 axillary peduncles per node, hispid. Spikelets many, terete, squarrose. Nut 1.0-1.2 mm long, smooth, surrounded by 3 short bristles and 3 quadrate scales with incurved, thickened, cucullate apices and a stalk forming about half their total length.

Paleotropics, into subtropics. Common in marshy areas with seasonal surface water in the plains. August-January. *CJS* 15672, *HFP* 2386, 2511.

Fuirena trilobites C. B. Clarke in J. Hooker, Fl. Brit. India 6: 666. 1893; C. B. Clarke, Ill. Cyper. t. 59, f. 5. 1909; Vartak, J. Univ. Poona Sci. & Tech. Sect. 40: 196. 1971.

Stems 1.5-2.5 mm wide. Nut 0.75 mm long. Scales anchor-shaped with stalk forming more than half their total length. Otherwise as *F. ciliaris*.

Deccan. Previously collected from Secunderabad (Hyderabad), Gokak (Belgaum) and Bangalore. Found at Dandiganahalli at the edge of a water channel below a tank, growing mixed with *F. ciliaris*, and likely to turn up elsewhere but seemingly much rarer than the last species. November-January. *HFP* 2403B.

Note: The above two species and the tropical African *F. leptostachya* Oliver, which has a slightly smaller spikelet and nut, and a scale form somewhat intermediate between the Indian species, need further study in the context of the whole genus to decide on their optimum taxonomic treatment. They might be regarded as one species with African and Indian subspecies, the latter with a variety. However the differences in scale shape appear to be constant and are of importance in the genus.

Fuirena umbellata Rottboell, Descr. Ic. Pl. 70, t. 19, f. 3. 1773; C. B. Clarke, Ill. Cyper. t. 59, f. 9. 1909; Gamble, Fl. Madras 1668(1157). 1931; Kern in Backer & Bakh. f., Fl. Java 3: 457. 1968; Vartak, J. Univ. Poona Sci. & Tech. Sect. 40: 194. 1971.

Robust plants to 1.5 m high from a creeping rhizome. Stems up to 1 cm across, 5-sided with ridged angles, the lowermost internode often bulbously thickened in wet habitats. Leaves with a prominent, generally dark ligule. Inflorescence generally of many spikelets in rounded clusters in branched partial panicles. Spikelets when young 5-angular, acute. Nut smooth with very short or no bristles and almost sessile, obovate, apiculate, 3-nerved scales.

Pantropics and subtropics. Rare, noted as locally common near Hebbsale (in upper Ghats) in water-logged marshes near rice fields. January. *HFP* 1362.

Fuirena uncinata (Willd.) Kunth, Enum. 2: 184. 1837; Gamble, Fl. Madras 1669(1158). 1931; Vartak, J. Univ. Poona Sci. & Tech. Sect. 40: 200. 1971. *Scirpus uncinatus* Willd., Sp. Pl. 1: 300. 1798.

Lax, tufted, hispid-pubescent annual. Stems 5-30 cm long. Inflorescence of few, dense, rounded partial panicles; spikelet clusters sessile or nearly so. Spikelets few-flowered angular echinate, golden and green becoming brown. Nut smooth, surrounded by three short, retrorsely-scabrid bristles and three shortly-stalked, orbicular or quadrate, reddish scales with a dorsal, setulose arista from the confluence of three nerves and a triangular, membranous, hairy apex investing the beak of the nut.

Peninsular India, Sri Lanka. Uncommon on seasonally wet ground, near Arsikere in the eastern plains. October-January. *HFP* 1264, 2228.

Note: Vartak (*l. c.*) describes 9 hypogynal structures whilst illustrating 3. Our specimen agrees with others examined in having 6 in two whorls.

Fuirena wallichiana Kunth, Enum. 2: 182. 1837; C. B. Clarke, Ill. Cyper. t. 58, f. 8. 1909; Gamble, Fl. Madras 1669(1158). 1931; Vartak, J. Univ. Poona Sci. & Tech. Sect. 40: 192. 1971.

Robust, rhizomatous, glaucous perennial. Stems up to 1 m long, sharply trigonous. Inflorescence of few large, subcylindric spikelets. Glumes grey-green, finely pubescent with a stout terminal mucro. Nut nearly sessile, striate with rows of transversely elongated cells, with a conical, sometimes ciliate, beak, surrounded by three simple bristles shorter to much shorter than the nut.

India. Common in marshy areas with seasonal surface water in the plains. October-July. *HFP* 2381, 2398, 2404.

Note: *Fuirena wallichiana* sometimes occurs without bristles, though this has not yet been seen in Hassan specimens. Fischer in Gamble (*l.c.*) records 6 bristles, 3 very short, but this requires confirmation, as confusion with bases of broken filaments is not impossible.

F. pubescens (Lam.) Kunth, a species closely similar to *F. wallichiana* in habit and inflorescence, occurs in northern India with a variety *pergamentacea* Fischer in the Palni Hills. It is to be distinguished by the smooth or slightly wrinkled surface of the nut and the invariable absence of bristles.

HEMICARPHA Nees

Small tufted annuals. Stems slender, leafy at base. Inflorescence a pseudo-lateral cluster of 1-several sessile spikelets. Lower bract erect, stem-like. Flowers bisexual. Stamens 1-2. Ovary partly surrounded by a membranous scale, sometimes much reduced. Stigmas 2. Nut narrowly to broadly obovate, minutely papillate, mucronate. Anatomy chlorocyperoid. Embryo cyperoid.

Hemicarpha isolepis Nees in Arnold, Edinb. New Phil. Journ. 17: 263. 1834. *Scirpus isolepis* (Nees) Boeck., Linnaea 36: 498. 1870; Gamble, Fl. Madras 1666(1156). 1931. *Lipocarpha isolepis* (Nees) J. Haines, Bot. Not. 124: 476. 1971.

Stems to 10 cm, filiform, clustered on a short rhizome. Leaves 2-3, filiform, obtuse, shorter than stems, with red-brown sheaths. Spikelet 1, elongate-ovate, obtuse. Glumes obovate, truncate, mucronulate, red in the upper part. Stamen 1. Ovary invested by 1 or 2 membranous scales. Style very short. Stigmas 2. Nut narrowly obovate, plano-convex to almost terete.

Tropical Africa, India, Thailand. Rare (or overlooked), in eastern plains near Dandiganahalli, in sandy soil below tank. November. *HFP* 2407.

Note: Belonging to a group of species, at present placed variously in *Scirpus, Cyperus* and *Lipocarpha*, which requires generic revision.

HYPOLYTRUM L. C. Richard

Perennial herbs with a basal tuft of leaves. Flowering stem trigonous, central or axillary, sometimes scapiform. Inflorescence usually corymbose. Spikelets few to numerous, often globular in fruit with spirally arranged, one-nerved glumes. Glume enclosing an ovary with 2 stigmas and 2 laterally placed stamens within keeled, ciliate, partially connate, hyaline scales. Nut biconvex, elliptic or ovate, hard below and spongy above.

Hypolytrum nemorum (Vahl) Spreng., Syst. Veg. 1: 233. 1824; Kern in Backer & Bakh. f., Fl. Java 3: 456. 1968. *Schoenus nemorum* Vahl, Symb. Bot. 3: 8. 1794. *Hypolytrum latifolium* L. C. Rich. ex Pers., Syn. Pl. 1: 70. 1805; C. B. Clarke, Ill. Cyper. t. 106, f. 1-12. 1909; Gamble, Fl. Madras 1673(1161). 1931.

Robust rhizomatous perennial. Stem leafy, triquetrous. Leaves and leafy bracts 3-nerved. Inflorescence terminal, paniculate, rounded-

pyramidal with short rigid branches. Glume red-dotted. Nut brown with the paler, spongy top forming 1/4-1/3 the total length.

India to Polynesia. Occasional, Shiradi Ghat, Kempuhole in partial shade. August. *CJS* 14445, *HFP* 1486.

Note: Kern (*l.c.*) notes that this is a very polymorphic species. It is closely related to the African *H. purpurascens* Cherm.

KYLLINGA Rottboell *nom. cons.*

Rhizomatous herbs. Stems leafy at the base only. Leaves linear; blades sometimes reduced; ligule absent. Inflorescence capitate; spikelets sessile on 1-4(-5) short swollen rays forming short broad crowded spikes; bracts whorled beneath the head, often 3. Spikelets small, of 1, 2 or rarely 3 flowers, ovate or oval, much flattened. Glumes distichous, sharply keeled, flattened, more or less membranous, muticous, sometimes with a distinct wing on the midrib. Lower flower(s) bisexual, uppermost male or sterile. Hypogynal structures absent. Stamens 3. Stigmas 2. Nut strongly flattened, narrowly to broadly elliptical, not beaked.

1 Rhizome short, tufted. Head normally lobed with 3-4 spikes, though a few stems may bear a single spike.
2 Spikes all nearly equal in size forming a rounded pyramidal head. Small plants with thickened stem bases.....*K. tenuifolia*
2 Central spike much the largest and more or less cylindrical. Medium sized plants with a fragrant rhizome without thickened stem bases.....*K. odorata*
1 Rhizome long, creeping. Head normally of a single spike, though a few stems may have small lateral spikes.
3 Leafy plants. Glumes twice as long as the nut each with a conspicuous whitish often red-dotted wing in the upper part and a short straight or recurved tip..*K. nemoralis*
3 Many leaves reduced to bladeless sheaths. Glumes equaling to somewhat exceeding the nut, gradually narrowed into long recurved tips.
4 Robust plants with usually thick rhizomes covered by dark purple scales. Bracts long, finally deflexed. Glumes often golden-red with reddish veins..*K. melanosperma*
4 Small to medium sized plants with elongated, thin (2-4 mm) rhizomes covered by brown or brownish-red scales. Bracts short, often spreading. Glumes whitish .....*K. brevifolia*

Kyllinga brevifolia Rottboell, Descr. Ic. Pl. 13, t. 4, f. 3. 1773; C. B. Clarke, Ill. Cyper. t. 1, f. 1-4. 1909; Gamble, Fl. Madras 1624(1130). 1931. *Cyperus brevifolius* (Rottb.) Hasskarl, Catal. Bogor. 24. 1844; Kueken. in Engl., Pflanzenr. 101: 600. 1936; Kern in Backer & Bakh. f., Fl. Java 3: 470. 1968.

1 Glume 2.5-3 mm long with ciliate keel.....var. *brevifolia*
1 Glume 2.0 mm long, with glabrous keel.....var. *stellulata*

var. **brevifolia**

Perennial with slender, flexuose, creeping rhizome. Stems slender,

3-30 cm. Leaves 0.2 with blades shorter than stems. Bracts 3-4, short, stiff. Head truncate-conical, greenish or straw-colored. Glume with a short recurved mucro.

Paleotropics & into subtropics. Common on irrigated or marshy ground in plains. July-November. *HFP* 259, 2199, 2400, 2504.

var. **stellulata** (Valck.-Sur.) Hooper *comb. nov. Cyperus brevifolius* (Rottb.) Hasskarl var. *stellulatus* (Valck.-Sur.) Kueken. in Engl., Pflanzenr. 101: 603. 1936.

Lowermost bract usually erect. Head globose, golden-yellow. Otherwise as var. *brevifolia.*

Indomalaysia, Australia. Uncommon, edge of road in a dry deciduous forest zone at Byra. October. *HFP* 2267.

Kyllinga melanosperma Nees in Wight, Contrib. Bot. India 91. 1834; Gamble, Fl. Madras 1624(1130). 1931. *Cyperus melanospermus* (Nees) Valck.-Sur., Het Gesl. Cyp. Mal. Archip. 50, t. 2. f. 8. 1898; Kueken. in Engl., Pflanzenr. 101: 583. 1936; Kern in Backer & Bakh. f., Fl. Java 3: 470. 1968.

Rhizome dark purple-red, horizontally or obliquely creeping, about 5 mm thick. Stems up to 50 cm, sharply triangular with only 1 or 2 bladed leaves. Bracts long, dwarfing the inflorescence, to 5 mm wide. Head globose to oblong, yellow to golden. Glume with a green ciliate keel, red-veined sides and a short recurved mucro.

Paleotropics. Common, in or close to surface water, rice fields etc. September-December. *HFP* 1028, 2279, 2442.

Kyllinga nemoralis (Forster) Dandy ex Hutchinson, Fl. W. Trop. Afr. 2: 487. 1936. *Kyllinga monocephala* Rottboell, Descr. Ic. Pl. 13, t. 4, f. 4. 1773, *nom. superfl.*; Gamble, Fl. Madras 1624(1130). 1931. *Thryocephalon nemorale* J. R. & G. Forster, Char. Gen. Pl. 130. 1776. *Cyperus kyllingia* Endlicher, Cat. Hort. Acad. Vindob. 1: 94. 1842; Kueken. in Engl., Pflanzenr. 101: 606, t. 64, f. C-D. 1936; Kern in Backer & Bakh. f., Fl. Java 3: 469. 1968.

Rhizome slender, flexuose, creeping. Stems leafy. Head oblong, solid, white. Glume with a broad, opaque, ciliate wing and short acute tip. Nut brown.

Pantropics & subtropics. Occasional in waste places as on roadsides, widespread. July-November. *CJS* 14140, *HFP* 2443.

Kyllinga odorata Vahl, Enum. Pl. 2: 383. 1805; C. B. Clarke, Ill. Cyper. t. 2, f. 3-6. 1909. *Kyllinga cylindrica* Nees in Wight, Contrib. Bot. India 91. 1834; Gamble, Fl. Madras 1624(1130). 1931. *Cyperus sesquiflorus* (Torrey) Mattf. & Kueken. var. *subtriceps* (Nees) Koyama, Quart. J. Taiwan Mus. 14: 192. 1961; Kern in Backer

& Bakh. f., Fl. Java 3: 469. 1968. *Cyperus sesquiflorus* (Torrey) Kueken. ssp. *cylindricus* (Nees) Koyama in Hara, Fl. East. Himalaya 389. 1966.

Rhizome shortly creeping, fragrant. Stem 15-40 cm, leafy. Central (or only) spike cylindrical, white or greenish, usually with smaller lateral spikes at base. Bracts 4-6, deflexed at maturity. Spikelets broadly ovate. Glumes rather blunt, clearly ribbed. Nut black at maturity.

Pantropics. Not common, at Byrapura in moist sandy places in a deciduous forest. July. *HFP* 362.

Kyllinga tenuifolia Steudel, Syn. Pl. Glum. 2: 69. 1855. *Kyllinga triceps* Rottboell, Desc. Ic. Pl. 14, t. 4, f. 6. 1773, *nom. superfl.*; Gamble, Fl. Madras 1623(1130). 1931.

Small, tufted, leafy plants. Stems 3-15 cm, thickened at the base by leaf sheath remains. Leaves long-pointed. Head rounded-pyramidal, greenish or yellowish-white with 3 spreading bracts. Glumes thin, unwinged, clearly ribbed.

Paleotropics & into subtropics. Locally common in damp grazed grassland, lawns etc. on eastern and western plains. August-December. *CJS* 14348, *HFP* 2235, 2552.

LIPOCARPHA R. Brown *nom. cons.*

Stems tufted, leafy at the base. Ligule absent. Inflorescence a terminal, *Kyllinga*-like head of rounded lobes of many, spirally arranged glumes. Glume rounded on back, deciduous, enclosing 1-2 stamens and a nut wrapped round by 2 membranous, dorsally and ventrally placed scales. Style short, not thickened at base. Nut oblong, compressed.

1 Head greenish or silvery. Glume more than 2 mm long.....*L. chinensis*
1 Head dark brown. Glume less than 2 mm long.....*L. sphacelata*

Lipocarpha chinensis (Osbeck) Kern, Blumea, Suppl. 4: 167. 1958 and in Backer & Bakh. f., Fl. Java 3: 457. 1968. *Scirpus chinensis* Osbeck, Dagb. Ostind. Resa 220. 1757. *Hypaelyptum argenteum* Vahl, Enum. Pl. 2: 283. 1805. *Lipocarpha argentea* (Vahl) R. Br. in Tuckey, Narr. Exp. Congo 477. 1819; C. B. Clarke, Ill. Cyp. t. 60, f. 4-7. 1909; Gamble, Fl. Madras 1670(1158). 1931.

Annual or perennial. Stems to 60 cm × 2.5 mm, stiff. Leaves stiff, spreading. Involucral bracts finally deflexed. Inflorescence lobes 5-6 (10) rounded, obtuse. Scales much exceeding nut.

Paleotropics & into subtropics. Uncommon in a marshy area at Hanbal, upper Ghats and at Byra. October-November. *CJS* 15683, *HFP* 2257.

Lipocarpha sphacelata (Vahl) Kunth, Enum. 2: 267. 1837; J. Hooker,

Fl. Brit. India 6: 667. 1894. *Kyllinga triceps* Lam., Ill. Gen. 1: 148. 1791; non Rottb. 1773. *Hypaelyptum sphacelatum* Vahl, Enum. Pl. 2: 283. 1805. *Lipocarpha triceps* Nees in Wight, Contrib. Bot. Ind. 92. 1834; Gamble, Fl. Madras 1670(1158). 1931.

Annual. Stems 10-40 cm. Bracts spreading. Inflorescence lobes 2-5. Scales about equaling nut.

Central America eastward to Thailand. Locally common in damp grassy places in plains. September-November. *CJS* 15200, *HFP* 2226, 2286, 2384.

MARISCUS Vahl *nom. cons.*

As *Cyperus* but rachilla deciduous above the prophyll and falling before the glumes (sometimes after in *M. squarrosus*).

1 Spikelets many-flowered. Glumes aristate.
2 Spikelets few, digitate. Glumes more than 2 mm long with membranous sides..... *M. maderaspatanus*
2 Spikelets many, crowded in ovoid spikes. Glumes less than 2 mm long with ridged sides..... *M. squarrosus*
1 Spikelets 1-3 flowered.
3 Stem-bases thickened by persistent, brown leaf-sheaths. Inflorescence capitate.... *M. dubius*
3 Stem bases not bulbously thickened.
4 Rhizome slender. Spikelets often curved, with one fertile glume..... *M. paniceus*
4 Rhizome thick.
5 Spikelets straight in cylindrical spikes, with one or two fertile glumes... *M. sumatrensis*
5 Spikelets crowded in obovate spikes with at least two fertile glumes..... *M. cyperinus*

Mariscus cyperinus (Retz.) Vahl, Enum. Pl. 2: 377. 1805; Gamble, Fl. Madras 1644(1143). 1931. *Kyllinga cyperina* Retz., Obs. 6: 21. 1791. *Cyperus cyperinus* (Retz.) Valck.-Sur., Het Gesl. Cyp. Mal. Arch. 154, t. 6, f. 10. 1898.

Shortly rhizomatous. Stem bases somewhat thickened, covered with dark fibers. Rays none to short. Spikes obovoid. Spikelets suberect. Nut 2.0×0.8-0.9 mm.

S. E. Asia to Queensland. Occasional in semi-evergreen forest of upper Ghats. October. *HFP* 2335.

Note: The material is overmature but appears to match the variety *bengalensis* C. B. Clarke.

Mariscus dubius (Rottb.) Kueken. ex Fischer in Gamble, Fl. Madras 1644(1142). 1931. *Cyperus dubius* Rottb., Descr. Ic. Pl. 20, t. 4, f. 5. 1773; Kueken. in Engl., Pflanzenr. 101: 563. 1936; Kern in Backer & Bakh. f., Fl. Java 3: 473. 1968.

Tufted perennial. Stems to 30 cm, bulbous at the base; sheaths brown, papery. Inflorescence subglobose, lobed with long spreading or reflexed bracts. Spikelets congested, ovate to lanceolate, acute, 3-6-flowered.

Glumes broadly ovate, obtuse and apiculate, with several raised nerves. Nut about 1.5 mm long.

Tropical Africa, Indomalaysia. Occasional in open, rocky ground of eastern plains. August-October. *CJS* 14250, *HFP* 2236.

Mariscus maderaspatanus (Willd.) Napper, J. E. African Nat. Hist. Soc. 28, 124: 10. 1971. *Cyperus maderaspatanus* Willd., Sp. Pl. 1: 278. 1798. *Mariscus squarrosus* C. B. Clarke in J. Hooker, Fl. Brit. India 6: 623. 1893 (*quoad spec.*); Gamble, Fl. Madras 1645(1143). 1931, non *Cyperus squarrosus* L.

Annual. Stems to 10 cm. Leaves few, flaccid. Inflorescence with few rays; bracts much exceeding rays, spreading. Spikes hemispherical. Spikelets linear 6-25 × about 2 mm. Glumes narrowly oblong 2.5 mm long, sides stramineous, keel strong, green, excurrent in a recurved arista. Nut oblong, 1.25 mm long, puncticulate.

Tropical E. Africa to S. E. Asia. Occasional on sandy, damp slope in semi-evergreen forest of lower Ghats. November. *HFP* 2451.

Note: This species changes much in appearance from flowering to fruiting due to great elongation and thickening of the spikelets.

Mariscus paniceus (Rottb.) Vahl, Enum. Pl. 2:373. 1805; C. B. Clarke, in J. Hooker, Fl. Brit. India 6: 620. 1893; Gamble, Fl. Madras 1644(1143). 1931. *Kyllinga panicea* Rottb., Descr. Ic. Pl. 15, t. 4, f. 1. 1773.

Slenderly rhizomatous or tufted. Stems to 40 cm, leafy. Bracts 5-6. Rays 0-5 cm. Spikes 3-9, shortly cylindric to obovoid. Spikelets 1-flowered, acute, often recurved. Nut 2.0 × 0.6 mm.

Deccan, Sri Lanka to Tonkin. Occasional in semi-evergreen forest of upper Ghats. November. *HFP* 2452, 2478.

Note : Collected by Meebold at Belur in 1908.

Mariscus squarrosus (L.) C. B. Clarke in J. Hooker, Fl. Brit. India 6: 623. 1893. *Cyperus squarrosus* L. in Torner, Cent. Pl. 2: 6. 1756; Kern, Blumea 10: 642. 1960. *Cyperus aristatus* Rottb., Descr. Pl. Rar. Programm. 22. 1772; Gamble, Fl. Madras 1640(1143). 1931; Kueken. in Engl., Pflanzenr. 101: 502. 1936.

Leafy annual. Stems 5-20 cm. Leaf sheaths inflated, purple. Inflorescence once anthelate; bracts exceeding rays. Spikelets congested in hemispherical or oblong spikes. Glumes elliptic, reddish brown with clear raised nerves and recurved arista. Nut obovate, puncticulate.

Pantropics. Frequent in the plains on moist, sandy soil. July-November. *CJS* 15020, *HFP* 2353, 2550.

Mariscus sumatrensis Retzius, Obs 4: 13. 1786. *Scirpus cyperoides* L., Mant. Alt. 181. 1771, non *Mariscus cyperoides* (Roxb.) Dietrich, Sp. Pl. 2: 438. 1833. *Mariscus sieberianus* Nees ex C.B. Clarke in

J. Hooker, Fl. Brit. India 6: 622. 1893; Gamble, Fl. Madras 3: 1645(1143). 1931. *Cyperus cyperoides* (L.) O. Kuntze, Rev. Gen. Pl. 3, 2: 333. 1898.

Rhizome short, irregularly thickened. Rays well-developed. Spikes cylindrical; spikelets 1-2-flowered. Nut 1.8×0.6 mm.

Paleotropics & into subtropics. In a dry deciduous forest at Byra. August. *CJS* 13984.

Note: The forms of this variable species which have a single fertile glume are very close to *M. paniceus* which however does not have long cylindrical spikes of straight spikelets.

PYCREUS Palisot de Beauvois

Generally annual. Leaf blades well-developed. Bracts leaf-like. Inflorescence generally once or twice anthelate. Spikelets strongly flattened, not shed. Glumes numerous, distichous, deciduous. Flowers bisexual. Stamens generally 2; anthers with a small tip to the connective. Nut dark brown to black, apiculate, flattened with one edge against the generally winged rachilla. Stigmas 2. Style not thickened at base. Anatomy chlorocyperoid. Embryo cyperoid.

1 Glume 2.5-3.0 mm long with a conspicuous, white, hyaline margin.....*P. macrostachyos*
1 Glume smaller with an inconspicuous or no white margin.
2 Apex of the glume obtuse and distinctly mucronate.....*P. pumilus*
2 Apex of the glume obtuse to acute, sometimes mucronulate.
3 Surface of the nut horizontally marked with white raised lines; surface cells vertically elongate.
4 Inflorescence of few spikelets in a single spike. Bracts 2, borne about 5 mm apart. Glumes yellow-brown.....*P. stramineus*
4 Inflorescence of one to several spikes. Bracts 2-3, whorled. Glumes red-brown .....*P. diaphanus*
3 Surface of the nut puncticulate; surface cells small, isodiametric or nearly so.
5 Glumes striped with dark red on the margin. Stems rooting from lower nodes. Leaves distant.....*P. sanguinolentus*
5 Glumes concolorous or margin pale. Stems not rooting from lower nodes. Leaves basal.
6 Leaves about 1 mm wide. Glumes 2/3 overlapping, dark red-brown to black with pale keel and margin.....*P. globosus*
6 Leaves about 3 mm wide. Glumes 1/2 overlapping, straw-colored to reddish-brown.....*P. polystachyos*

Pycreus diaphanus (Roemer & Schultes) S. Hooper & Koyama. *Cyperus diaphanus* Schrad. ex J. A. Schultes, Mant. 2: 477. 1824; Kern, Blumea 10: 644. 1960. *Cyperus latespicatus* Boeckeler, Flora 42: "433" (441). 1859; Kueken. in Engl., Pflanzenr. 101: 392. 1936; Kern, Reinwardtia 2: 124, f. 13. 1952. *Pycreus latespicatus* (Boeckeler) C. B. Clarke in J. Hooker, Fl. Brit. India 6: 590. 1893.

1 Spikelets 3-4 mm wide. Nut 1.1 mm long.....var. *diaphanus*
1 Spikelets 2.5 mm wide. Nut 0.9 mm long.....var. *gracilescens*

var. **diaphanus**

Stems loosely tufted, to 45 cm. Leaves 1-2 per stem. Inflorescence once anthelate. Bracts 2, 1 more or less erect. Spikes few, rounded. Spikelets oblong, 12×3.5 mm, obtuse. Glumes ovate, 2.00 mm long, obtuse with golden or red-brown nerveless sides, dark spotted at the tip. Nut 1.1×0.8 mm.

India, China, Malaysia. Rare (or overlooked), in marshy ground 3 km north of Hassan town. November. *HFP* 2501.

var. **gracilescens** (Kueken.) S. Hooper *comb. nov.* *Cyperus latespicatus* Boeckeler var. *gracilescens* Kueken. in Engl., Pflanzenr. 101: 393. 1936.

Spikelets about 9×2.5 mm. Glume 1.8 mm long. Nut 0.9×0.7 mm.

Indomalaysia. Rare (or overlooked), in marshy hollow in dry deciduous forest at Byra, eastern plains. October. *CJS* 15231.

Note: The smaller nut clearly distinguishes the above gathering and one other from the remainder of Indian collections of the species at Kew. Kern may be right in considering this a polymorphic species in which Kuekenthal's varieties are of doubtful systematic value. On the other hand, on the limited evidence available, specific status is possible. Further collection is needed.

Pycreus globosus (Allioni) Reichenbach, Fl. Germ. Exc. 140(10). 1830; Gamble, Fl. Madras 1627(1132). 1931. *Cyperus globosus* Allioni, Fl. Pedem. Auct. 49. 1789. *Pycreus capillaris* Nees, Linnaea 9: 283. 1834; J. Hooker, Fl. Brit. India 6: 591. 1893.

var. **nilagiricus** (Steudel) C. B. Clarke, J. Linn. Soc., Bot. 36: 204. 1903. *Cyperus nilagiricus* Hochst. ex Steudel, Syn. Pl. Glum. 2: 2. 1854. *Cyperus globosus* Allioni var. *nilagiricus* (Steudel) C. B. Clarke, J. Linn. Soc., Bot. 21: 49. 1884; Kueken. in Engl., Pflanzenr. 101. 355. 1936.

Annual or perennial. Stems 15-40 cm. Leaves stiff. Inflorescence once anthelate. Spikes globose to oval. Spikelets linear, about 12×2 mm. Nut 0.8-1.0×0.6 mm, irridescent.

Paleotropics. Common throughout in marshy and irrigated places. October-January. *CJS* 15725, *HFP* 2198, 2262.

Pycreus macrostachyos (Lamarck) J. Raynal, Kew Bull. 23: 314. 1969. *Cyperus macrostachyos* Lamarck, Ill. Gen. 1: 147. 1791. *Pycreus albomarginatus* Nees in Martius, Fl. Bras. 2, 1: 9. 1842; Gamble, Fl. Madras 1628(1133). 1931. *Cyperus albomarginatus* (Nees) Steudel, Syn. Pl. Glum. 2: 10. 1854; Kueken. in Engl., Pflanzenr. 101: 359, f. 42 E-H. 1936.

Stem solitary, robust, to 45 cm. Leaf sheaths papery, purple veined. Inflorescence twice anthelate; rays to 12 cm.; prophylls purple. Spikes cylindric. Spikelets distant, spreading, to 20×4 mm, acute. Glumes spreading widely at maturity, elliptical, obtuse or retuse with a broad,

nerved keel, red brown nerveless sides and a conspicuous white margin. Nut 1.8×1.0 mm.

Pantropics. Uncommon rice field weed, in shallow water at Konnanur, western plains. November. *HFP* 2421.

Note: *P. puncticulatus* (Vahl) Nees has a similar aspect but the spikelet rachilla is markedly flexuose, and the glumes are appressed with narrow nerved keels. Govindu & Thirumalachar (*The Cyperaceae of Mysore* 3. 1960) state that it is often met with in Karnataka. It has been much collected from near Madras.

Pycreus polystachyos (Rottboell) Beauvois, Pl. Oware Benin 2: 48, t. 86, f. 2. 1807. *Cyperus polystachyos* Rottboell, Descr. Pl. Rar. Programm. 21. 1772; Kueken. in Engl., Pflanzenr. 101: 367. 1936. *Pycreus odoratus* Urban, Symb. Antill. 2: 164. 1900; Gamble, Fl. Madras 1627(1132). 1931, non *Cyperus odoratus* L., 1753.

1 Inflorescence capitate; rays wanting or few and short.....var. *polystachyos*
1 Inflorescence anthelate; rays and spikelets spreading.....var. *laxiflorus*

var. **polystachyos**

Tufted annual or perennial. Stems 10-60 cm. Leaves 2-4 mm wide. Spikelets linear-lanceolate, acute. Glumes regularly half-imbricate, elliptic, acute, mucronulate with nerveless, membranous straw-colored to golden-brown sides and narrow green keel. Nut 1.0-1.2×0.5 mm.

Pantropics & into subtropics. Scattered in marshy areas in plains. October-November. *HFP* 2359.

var. **laxiflorus** (Bentham) C. B. Clarke in J. Hooker, Fl. Brit. India 6: 592. 1893. *Cyperus polystachyos* Rottboell var. *laxiflorus* Bentham, Fl. Austral. 7: 261. 1878; Kueken. in Engl., Pflanzenr. 101: 370. 1936.

Glumes often ferrugineous.

Distribution as typical variety but apparently rarer. In a semi-evergreen forest in Kenchankumri. November. *HFP* 1523, 2449.

Note: The varieties, though well distinguished at their extremes, overlap somewhat so that their systematic value is doubtful.

Pycreus sulcinux (C. B. Clarke) C. B Clarke, a similar but more slender species with a single stamen and a depression on either side of the nut might be expected in Hassan.

Pycreus pumilus (L.) Nees, Linnaea 9: 283. 1834. *Cyperus pumilus* L. in Torner, Cent. Pl. 2: 6. 1756; Kueken. in Engl., Pflanzenr. 101: 375. 1936; Kern in Backer & Bakh. f., Fl. Java 3: 470. 1968. *Cyperus nitens* Retzius, Obs. 5: 13. 1789. *Pycreus nitens* (Retzius) Nees, Nova Acta Acad. Caes. Leop.-Carol. German. Nat. Cur. 19, Suppl. 1: 53. 1843; J. Hooker, Fl. Brit. India 6: 591. 1893.

Tufted ephemeral. Stems 2-25 cm. Leaves 2-3 per stem. Inflorescence capitate or shortly anthelate. Spikes congested. Spikelets linear 7-30×1.5-2.5 mm, spreading to reflexed. Glumes obovate, 1.2 mm

long, retuse, apiculate with nerveless membranous sides. Stamens 1-2. Nut 0.6×0.4 mm.

Pantropics & into subtropics. Occasional on damp sandy alluvium throughout the area. September-November. *CJS* 14742, *HFP* 2233, 2445.

Note: Notable for a marked change in aspect between young and old inflorescences produced by increase in size of the spikelets during maturation accompanied by shrinkage of the membranous side of the glume.

Pycreus sanguinolentus (Vahl) Nees, Linnaea 9: 283. 1834; Gamble, Fl. Madras 3: 1627(1132). 1931. *Cyperus sanguinolentus* Vahl, Enum. Pl. 2: 351. 1805; Kueken. in Engl., Pflanzenr. 101: 385. 1936; Kern in Backer & Bakh. f., Fl. Java 3: 471. 1968.

Annual or perennial. Stems not or loosely tufted, decumbent, stout, to 30 cm. Leaves soft, flat. Inflorescence capitate, of digitate or shortly spicate spikelets. Spikelets oblong about 10×3 mm. Nut 1.0-1.3×0.8-1.0 mm.

Paleotropics & into subtropics. Common in marshy areas and edge of open water in plains. October-November. *HFP* 2264, 2401, 2558.

Note: Kern (*l.c.*) recognizes four ssp. in Java of which we have only the typical one.

Pycreus stramineus C. B. Clarke in J. Hooker, Fl. Brit. India 6: 589. 1893; Gamble, Fl. Madras 1627(1132). 1931. *Cyperus stramineus* Nees in Wight, Contrib. Bot. India 74. 1834 non Desfontaines, 1820. *Cyperus substramineus* Kueken. in Engl., Pflanzenr. 101: 398. 1936.

Tufted. Stems slender, shining (at least when dry), to 30 cm. Leaves filiform. Inflorescence simply spicate. Spikelets few, linear, 12×2 mm. Glumes ovate, 2.2 mm long, subacute, mucronulate with narrow keel and nerveless golden-brown sides. Nut 0.9×0.65 mm.

Indomalaysia. Rare (or overlooked), on bunds of rice fields at Hanbal in the Ghats. October. *CJS* 10113.

QUEENSLANDIELLA Domin

Leafy annual. Bracts leaf-like. Inflorescence once anthelate. Spikelets strongly flattened, deciduous above the two sterile glumes. Glumes numerous, distichous, not deciduous. Flowers bisexual. Stamens 2. Stigmas 2. Nut flattened. Anatomy chlorocyperoid. Embryo modified cyperoid.

Queenslandiella hyalina (Vahl) Ballard in Hooker's Icones Plantarum t. 3208. 1933. *Cyperus hyalinus* Vahl, Enum. Pl. 2: 329. 1805. *Cyperus pumilus* Nees in Wight, Contrib. Bot. India 74. 1834, non L. *Pycreus hyalinus* Domin, Bibl. Bot. 85: 417. 1915; Gamble, Fl. Madras 1627(1132). 1931.

Caespitose. Stems to 40 cm, thickened at the base. Leaves about 6 mm wide, flaccid. Bracts 4-6, unequal. Spikes oblong. Spikelets distant spreading, rachilla broadly winged. Glumes ovate, strongly keeled, greenish to golden-yellow, sides clearly nerved. Nut suborbicular, truncate, puncticulate.

Paleotropics. Rare, as weed of cultivation near Channarayapatna, eastern plains. November. *HFP* 2412.

RHYNCHOSPORA Vahl *nom. cons.*

Tufted herbs. Inflorescence capitate or branched. Spikelets small, generally terete, with few, spirally arranged glumes. Lower 3-4 glumes empty, shorter than the fertile ones. Flower bisexual with 3-6 scabrid or plumose bristles. Styles undivided or bifid with a dilated base which persists as a beak to the nut.

Rhynchospora corymbosa (L.) Britton, Trans. New York Acad. Sci. 11: 84. 1892; Gamble, Fl. Madras 1672(1160). 1931; Kueken., Bot. Jahrb. 74: 410. 1949; Kern in Backer & Bakh. f., Fl. Java 3: 484. 1968. *Scirpus corymbosus* L. in Torner, Cent. Pl. 2: 7. 1756. *Rhynchospora aurea* Vahl, Enum. Pl. 2: 229. 1805; J. Hooker, Fl. Brit. India 6: 670. 1893.

Robust, leafy perennial. Leaves with saw-toothed edges and a dark membranous projection of the sheath opposite the blade (contraligule). Spikelets many, brown, lanceolate, in terminal and lateral corymbs. Bristles 6, scabrous. Nut brown, rugose with a conical grooved beak.

Pantropical. Occasional, in the upper Ghats at Mankanahalli in shallow water of a tank in semi-evergreen forest. July-December. *CJS* 15769, *HFP* 306.

RIKLIELLA J. Raynal

Small tufted annuals. Stems slender, leafy at base. Inflorescence a cluster of several sessile spikelets. Glumes caducous, oblanceolate or obovate, with a single mid-rib excurrent in a setulose-tipped arista. Flowers bisexual. Style short. Hypogynous structures absent. Nut elliptical or narrowly obovate, patterned by rows of rounded surface cells. Anatomy chlorocyperoid. Embryo cyperoid.

Note: Closely similar in appearance to small species of *Lipocarpha* and *Ascolepis* (not present in Hassan) from which it differs in lacking hypogynal structures. From *Isolepis* it is distinguished by its embryo, anatomy and physiology. The distinction from *Hemicarpha* is questionable.

1 Stigmas 2. Bracts spreading except in very young inflorescence.....*R. kernii*
1 Stigmas 3. Lower bract erect and inflorescence pseudolateral.....*R. squarrosa*

Rikliella kernii (Raymond) J. Raynal, Adansonia ser. 2, 13: 155. 1973.
Scirpus kernii Raymond, Naturaliste Canad. 86: 230. 1959; J. Raynal, Adansonia ser. 2, 8: 95, t. 1, f. 1-5. 1968.

Stems to 15 cm, glaucous. Leaves filiform, canaliculate, obtuse; sheaths papery, red-purple. Bracts 2-3, spreading. Spikelets oblong, 5-8×4 mm, obtuse. Glumes 1 mm long with an arista of equal length. Nut 0.75×0.4 mm, compressed but four angled toward the base, black with 18-20 rows of surface cells.

Tropical Africa, India. Rare (or overlooked), in eastern plains near Dandiganahalli, in wet sandy area below tank. November. *HFP* 2402.

Note: Only recently detected in Asia. There are collections at Kew from Mysore and from Saugor, Madhya Pradesh (coll. T. S. Rama Rao); also an early collection in Rottler's herbarium 'Penins. Indiae Orientalis' (unlocalized) which is a mixture of *R. squarrosus* and *R. kernii* (cf. Raynal *l.c.* 1968). Small differences distinguish African and Indian collections, the former having wider leaves and about 25 rows of cells across the nut face.

Rikliella squarrosa (L.) J. Raynal, Adansonia ser. 2, 13: 154. 1973.
Scirpus squarrosus L., Mant. Alt. 181. 1771; Gamble, Fl. Madras 1166(1156). 1931; J. Raynal, Adansonia ser. 2, 8: 95, t. 1, f. 9-12. 1968. *Isolepis squarrosa* (L.) Kunth in H., B. & K., Nov. Gen. Pl. 1: 202. 1815.

Bracts 2, the larger erect. Spikelets ovoid, 3-5×2.5 mm. Glumes 0.5-0.75 mm long with arista of equal length. Nut 0.4-0.5 mm long, trigonous.

India, Sri Lanka to China. Rare (or overlooked), in or near water in the dry deciduous forest zone. October. *CJS* 13530B, *HFP* 2239, 2352.

SCHOENOPLECTUS (Reichenbach) Palla *nom. cons.*

Stems simple, often terete, bearing leaf sheaths below. Leaf blades very short or absent. Inflorescence pseudolateral, capitate or compact anthelate; bract solitary, stem-like and continuing the line of the stem or finally, reflexed, more or less sheathing at base. Spikelets ovoid to shortly cylindric. Stamens 3; anther connective crested. Stigmas generally 3. Nut obovate to orbicular, smooth or transversely undulate or ridged. Embryo schoenoplectoid. Anatomy eucyperoid.

1 Some spikelets pedunculate.
2 Bristles present, plumose.....*S. litoralis* ssp. *thermalis*

2 Bristles lacking.
3 Glume 2 mm long with a broad green keel. Stem 0.5-1.5 mm wide.....*S. lateriflorus*
3 Glume 3.5 mm long with a narrow mid-rib. Stem about 10 mm wide...*S. corymbosus*

1 All spikelets sessile.
4 Bristles present. Stem not septate.
5 Stem and bract sharply triquetrous. Stigmas 3 (rarely 2).....*S. mucronatus*
5 Stem terete. Stigmas 2.....*S. juncoides*
4 Bristles lacking. Stem septate.
6 Stem 1-1.5 mm wide.....*S. senegalensis*
6 Stem 3-10 mm wide.....*S. articulatus*

Schoenoplectus articulatus (L.) Palla, Bot. Jahrb. Syst. 10: 299. 1888. *Scirpus articulatus* L., Sp. Pl. 47. 1753; Gamble, Fl. Madras 1666(1156). 1931; Kern in Backer & Bakh. f., Fl. Java 3: 458. 1968.

Robust annual or perennial. Stems 10-30 cm long, terete, spongy, transversely septate, lowest internode often narrowed. Inflorescence spherical, of many crowded spikelets. Bract terete, septate, acuminate, generally exceeding stem. Spikelets ovoid becoming cylindric, 8-15 mm long, terete. Glumes broadly ovate, acute, concave, keeled toward the apex, with many fine nerves. Bristles lacking. Nut obovate, 2 mm long, sharply trigonous, apiculate, black, smooth.

Paleotropics, Mediterranean region. Local on the plains in wet places or shallow water. October-January. *CJS* 12190, *HFP* 2192.

Note: A less robust variety with finely rugulose nuts only 1.5 mm long occurs in central and northern India.

Schoenoplectus corymbosus (Roth ex Roemer & Schultes) J. Raynal in J. B. Lebrun et al., Cat. Niger Plants, 1976 (in press). *Isolepis corymbosus* Roth ex Roemer & Schultes, Syst. Veg. 2: 110. 1817. *Scirpus corymbosus* auct. non L. nec Forskal, 1775; Gamble, Fl. Madras 1665(1155). 1931. *Scirpus inclinatus* Boissier, Fl. Orient. 5: 381. 1882. *Schoenoplectus inclinatus* Lye, Bot. Not. 124: 290. 1971.

Stout rhizomatous perennial. Stems to 180 cm, terete. Inflorescence of 4-8 rays bearing clustered spikelets, often proliferous. Bract about 3 cm long, erect, rigid. Spikelets ellipsoid, about 8×4 mm, terete. Glumes oblong, acute, with a narrow, minutely excurrent midrib. Bristles lacking. Nut elliptic to obovoid, about 2 mm long, unequally triquetrous, black, shining, punctate.

Paleotropics. Local, near Hassan in standing water. September-November. *CJS* 17932, *HFP* 2374.

Note: Isolepis inclinatus Delile the basionym of *Scirpus inclinatus* Boissier and *Schoenoplectus inclinatus* Lye is a *nom. nud.*

Schoenoplectus juncoides (Roxburgh) Palla, Bot. Jahrb. Syst. 10: 299. 1888. *Scirpus juncoides* Roxb., Fl. Ind. 1: 218. 1820; Kern in Backer & Bakh. f., Fl. Java 3: 459. 1968. *Scirpus erectus* auct. non Poiret, 1805; Gamble, Fl. Madras 1666(1156). 1931.

Annual. Stems to 80 cm×1-2 mm. Bract much shorter than stem, grooved on inner side; tip solid. Spikelets 1-5, sessile, ovoid-oblong,

terete, 8-15×4-6 mm. Glume orbicular, apiculate, concave with a green, 1-nerved keel and nerveless, membranous sides. Bristles 5-6, retrorsely scabrid, about equaling nut. Stigmas 2. Nut sub-orbicular, unequally biconvex, 2 mm long, apiculate, faintly transversely undulate, brown to black.

Madagascar, India to Japan, Australia. Scattered throughout the area in marshes and rice fields. April-November. *CJS* 16717, *HFP* 2423, 2475, 2503.

Schoenoplectus lateriflorus (J. F. Gmelin) Lye, Bot. Not. 124: 290. 1971. *Scirpus lateriflorus* J. F. Gmelin, Syst. Nat. 2, 1: 127. 1791; Kern in Backer & Bakh. f., Fl. Java 3: 459. 1968. *Scirpus supinus* L. var. *uninodis* C. B. Clarke in J. Hooker, Fl. Brit. India 6: 656. 1893. non *Isolepis uninodis* Delile, 1813. *Scirpus supinus* L. var. *lateriflorus* (Gmelin) Koyama, J. Fac. Sci. Univ. Tokyo sect. 3, Bot. 7: 302. 1958. *Scirpus supinus* auct. non L., 1753; Gamble, Fl. Madras 1666(1156). 1931.

Tufted annual. Stem 2-20 cm long, terete. Sheaths often enclosing a long-stigmaed ovary or enlarged nut at base. One leaf blade often developed. Bract 2-12 cm, slender, canaliculate, obtuse. Spikelets numerous, mostly sessile, ovoid, about 6×2 mm, acute with glumes in 5 ranks; rays absent or few and short. Glume ovate, papery, strongly keeled above, apiculate, tinged dark red-brown. Bristles lacking. Nut broadly elliptic to orbicular, unequally triquetrous, 1.2 mm long, sharply transversely ridged, black.

Paleotropics. Common on plains, in rice fields and other wet areas. November-January. *CJS* 16092, *HFP* 1122, 2376, 2397.

Schoenoplectus litoralis (Schrader) Palla, Verh. K. K. Zool-Bot. Ges. Wien 38, Sitzb.: 49. 1888 ('*littoralis*'). *Scirpus litoralis* Schrader, Fl. Germ. 1: 142, t. 5, f. 7. 1806; Gamble, Fl. Madras 1667(1156). 1931; Kern in Backer & Bakh. f., Fl. Java 3: 459. 1968.

ssp. **thermalis** (Trabut) Murbeck, Contrib. Fl. Maroc 1: 18. 1922; Townsend, Kew Bull. 15: 415-417. 1962. *Scirpus thermalis* Trabut in Battandier & Trabut, Fl. Alg. Monocot. ed. 2, 99. 1895. *Scirpus litoralis* Schrad. var. *subulatus* (Vahl) Chiovenda, Istit. Bot. Catania 1: 15. 1928.

Rhizomatous perennial. Stems to 70 cm×about 5 mm, somewhat spongy, terete throughout or trigonous below inflorescence. Sheaths splitting into fibers, sometimes with a short, setaceous blade. Inflorescence with 5-10 flattened, scabrid, branched rays. Bract rigid with an obtuse, flattened tip. Spikelets clustered, ellipsoid, about 7×3.5 mm, terete. Glumes broadly elliptic, retuse, mucronate, rounded on the back with papery red-dotted sides and fimbriate margin. Bristles 4, flattened,

plumose, slightly exceeding nut. Anther crest red, papillate. Stigmas 2. Nut obovate, biconvex, 2 mm long, apiculate, smooth.

Paleotropics. Occasional on eastern plains, at Holenarsipur and Belvathally, in standing water. July-February. *CJS* 13980, 16302.

Note: The typical ssp., differing chiefly in having sharply trigonous stems, occurs in a subtropical zone from the Mediterranean to Japan.

Schoenoplectus mucronatus (L.) Palla, Verh. K. K. Zool-Bot. Ges. Wien 38, Sitzb.: 49. 1888. *Scirpus mucronatus* L., Sp. Pl. 50. 1753; Gamble, Fl. Madras 1666(1156). 1931; Kern in Backer & Bakh. f., Fl. Java 3: 459. 1968. *Scirpus triangulatus* Roxb., Fl. Ind. 1: 219. 1820; Koyama, J. Fac. Sci. Univ. Tokyo, sect. 3, Bot. 7: 317. 1958.

Rhizomatous perennial. Stem to 60 cm, somewhat spongy. Inflorescence globose with about 10 spikelets. Bract acute, sometimes finally reflexed. Spikelet ovoid, acute, 11-15×4-7 mm. Glume broadly ovate, obtuse, apiculate, finely nerved throughout. Bristles 6, retrorsely scabrid, equaling nut. Nut broadly obovate, plano-convex, very faintly undulate, black.

Mediterranean region & Paleotropics. Not uncommon in plains, at margin of standing water. October-November. *CJS* 15669, *HFP* 2288, 2380.

Note: Plants from tropical regions differ from the typical Mediterranean form in having anthers twice as large but this and other small differences in size do not amount to a specific distinction.

Schoenoplectus senegalensis (Hochstetter ex Steudel) Palla, Bot. Jahrb. 10: 299. 1888. *Isolepis senegalensis* Hochst. ex Steud. Syn. Pl. Glum. 2: 96. 1855. *Scirpus jacobii* Fischer, Kew Bull. 1931: 103. 1931 (*'jacobi'*); Gamble, Fl. Madras 1666(1156). 1931. (*'jacobi'*) *Scirpus praelongatus* auct. non Poiret, 1805.

Annual. Stem 2-10 cm long. Bract much exceeding stem. Spikelets 5-8 mm long. Glumes orbicular, papery with a broad, nerved keel and almost nerveless sides, more or less 5 ranked. Nut 1.25 mm long, unequally trigonous, irregularly transversely undulate.

Africa, India. Rare, in plains at Nagpuri, on sandy soil near open water. January. *CJS* 16072.

Note: To be distinguished from the slender variety of *Scirpus articulatus* L. by its smaller, distinctly undulate nut. African plants differ in having a much longer stem and slightly larger nut.

SCLERIA Bergius

Perennial or annual herbs. Stems triangular, leafy. Leaves flat or keeled, 3-ranked; sheaths with a more or less well-marked tongue (contraligule) opposite the blade. Inflorescence of one terminal and generally

1-several axillary panicles, or spicate. Spikelets bisexual or unisexual sometimes clustered into small groups (glomerules). Stigmas 3. Nut globose or ovoid, with a hard, smooth or sculptured wall and a more or less trilobed disk or narrow stalk at the base.

1 Perennial with woody rhizome.
2 Inflorescence spreading, purplish. Nut-surface reticulate..... .....*S. terrestris*
2 Inflorescence narrow. Nut smooth, shining.....*S. lithosperma*
1 Annual.
3 Leaves 4-8 mm wide. Nut irregularly foveolate.....*S. foliosa*
3 Leaves 1.5-4 mm wide. Nut tuberculate.....*S. pergracilis*

Scleria foliosa Hochstetter ex A. Richard, Tent. Fl. Abyss. 2: 509. 1851; Robinson, Kew Bull. 18: 525. 1966.

Tufted annual. Leaves lanceolate, 4-8 mm wide, erect, acute, scabrid. Axillary inflorescences on short, erect peduncles from leafy bracts, rather dense. Male spikelets shortly pedicellate. Nut about 3×2 mm, ovoid, obtusely trigonous to terete, greenish becoming grey, often with darker lines down each face or black, with an irregularly foveolate or subreticulate surface.

Tropical & Southern Africa, Madagascar, India. Frequent beside water in shade in western plains and Ghats. October-November. *CJS* 15476, *HFP* 2260.

Note: *Scleria tessellata* Willd. is a similar species differing chiefly in the regularly reticulate surface pattern of the nut. It occurs to the south of our area at Mysore and in the Nilgiri Hills.

Scleria lithosperma (L.) Swartz, Prodr. Veg. Ind. Occ. 18. 1788; C. B. Clarke, Ill. Cyper. t. 123. 1909; Gamble, Fl. Madras 1677(1163). 1931; Kern, Blumea 11: 191, f. 64. 1961. *Scirpus lithospermus* L., Sp. Pl. 51. 1753.

Perennial with slender, nodulose rhizome. Stems slender, triquetrous. Leaves rigid, narrowly linear, greyish-green; contraligule convex or triangular, up to 2 mm long, brown hairy. Inflorescence slender with 2-3 distant, axillary, almost spicate panicles. Spikelets bisexual, 3-5 mm long, ferruginous. Nut about 2.5×1.75 mm, ovoid, obtusely trigonous, smooth, shining with a ferruginous glandular patch at the base of each face and a dark ring at the base of the stipe.

Pantropical. Not uncommon in moist semi-evergreen forest of the Ghats and in hills on plateau. July-August. *CJS* 13956, 14632.

Note: Two somewhat similar species of southern India which might occur in Hassan are *Scleria lithosperma* var. *linearis* Benth. (*S. lithosperma* var. *roxburghii* C. B. Clarke, of Hooker and of Gamble) distinguished by a transversely ridged surface to the nut, and *S. corymbosa* Roxb., a robust plant with leaves about 2 cm wide and a pointed nut, lacking basal brown warty patches.

Scleria pergracilis (Nees) Kunth, Enum. 2: 354. 1837; J. Hooker,

Fl. Brit. India 6: 685. 1894; C. B. Clarke, Ill. Cyper. t. 121, f. 1-5. 1909. *Hypoporum pergracile* Nees, Edinb. New Philos. J. 17: 267. 1834.

Lemon-scented, slender annual. Leaves bright green, about 2 mm wide. Spikelets bisexual in clusters in an interrupted, unbranched, terminal spike. Female glumes acuminate, dark red or black-spotted. Nut grey, globose, stipitate, beaked, tuberculate.

Paleotropics. Occasional on western plains in marshes. October-December. *CJS* 15793, *HFP* 2261.

Scleria terrestris (L.) Fassett, Rhodora 26: 159. 1924; Kern, Blumea 11: 170, f. 5 a-c. 1961. *Zizania terrestris* L., Sp. Pl. 991. 1753. *Scleria elata* Thwaites, Enum. 353. 1864; J. Hooker, Fl. Brit. Ind. 6: 690. 1893. *Scleria cochinchinensis* (Lour.) Druce, Bot. Soc. Exch. Club Br. Isles 4: 646. 1917; Gamble, Fl. Madras 1678(1163). 1931.

Tall herb. Stems scabrid, leafy throughout. Leaves about 1 cm broad, 3-nerved with a brown, ciliate, membranous margin to the contra-ligule. Inflorescence branched. Pedicels and glumes dark purple. Spikelets not crowded. Nut white with a quadrately tesselate or reticulate pattern of hairy ridges. Disk bluntly three-lobed with recurved sinuses.

Southern India to Australia. Occasional in upper Ghats in partial shade of semi-evergreen forest. August-December. *CJS* 15779, *HFP* 404.

Note: (a) The distribution given above is that of the species in the broad sense adopted by Kern. This variable species may, outside India, have the nut surface smooth or faintly patterned.

(b) *S. levis* Retz. (*S. hebecarpa* Nees) with slender stems and linear leaves has the lobes of the disk ligulate and acute or bifid. It might be found in Hassan.

139. POACEAE (GRAMINEAE)

T. P. Ramamoorthy

Note: We are grateful to Dr. W. D. Clayton and to the late Dr. N. L. Bor for their help in the study of these grasses.

Terrestrial to aquatic, annuals or perennials. Culms tufted, sometimes rhizomatous, erect, or creeping and rooting at nodes; sometimes reedlike or woody, hollow or solid at internodes, armed or not. Leaves alternate, more or less 2-ranked, consisting of sheath, ligule and blade. Leaf-sheath surrounding culm with overlapping or connate margins, swollen at base, hairy or glabrous. Ligule at the junction between sheath and blade membranous or chartaceous, ciliate or not, sometimes a tuft of hairs, rarely absent. Blade usually linear, rarely ovate, narrowed at base and petioled, usually articulated to sheath. Flowers in spiciform units called spikelets which are in paniculate, digitate, spiciform, racemose or

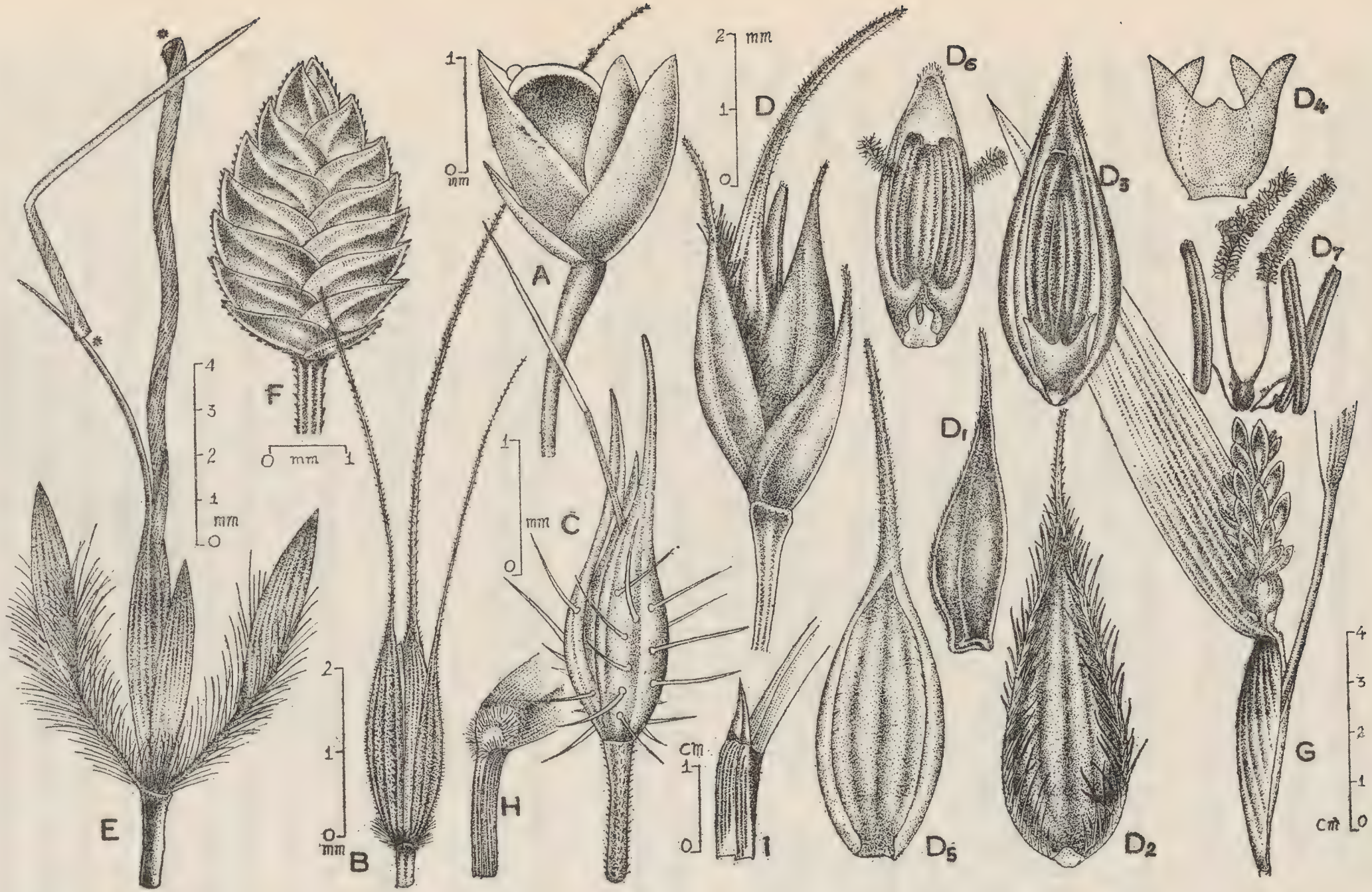


Fig. 111. POACEAE. *A. Sporobolus piliferus*: fruiting spikelet. *B. Garnotia arborum*: spikelet. *C. Arundinella ciliata*: spikelet. *D. Alloteropsis semialata*: spikelet; *D*1, lower glume; *D*2, upper glume; *D*3, lower lemma with stamens; *D*4, lower palea; *D*5, upper lemma; *D*6, upper palea with gynoecium and androecium; *D*7, ovary and stamens. *E. Chrysopogon hackelii*: 3-nate spikelet with 2 pedicelled and one sessile. *F. Eragrostis uniloides*: many-flowered spikelet. *G. Coix lacryma-jobi*: inflorescence with many male spikelets preceded by a solitary female. *H. Echinochloa colonum*: hairy ligule at tip of leaf sheath. *I. Oryza rufipogon*: membranous ligule.

variously branched inflorescences, rarely solitary. Spikelets rarely sessile or sunk in rachis, usually on a short stalk, called the pedicel with coriaceous to hyaline bracts which embrace the short axis of the spikelet (the *rachilla*). The lower two bracts [referred to as lower (G1) and upper (G2) *glumes*] empty, rarely awned, sometimes one or both wanting (in some bamboos, many empty, basal glumes may be found). The following bracts (*lemmas*) awned or not, usually with flower and subtending bract (*palea*) in their axils (lemma, palea and flower together called a *floret*); rachilla usually ending in a flower, sometimes aborted. Flower regular, usually bisexual. Perianth of 2-3 (rarely more), usually very small hyaline scales (*lodicules*). Stamens 1-many; filaments filiform with versatile anthers. Ovary superior, 1-locular; ovule 1, basal; styles 1 or 2, free; stigmas 2 or 3, free, plumose. Fruit usually a caryopsis.

Note: In the following descriptions in spikelets with more than 1 floret (more than 1 lemma) it may be assumed that all lemmas are similar, unless otherwise specified.

1 Culm woody with culm-sheaths (reduced leaves).
2 Internodes solid; hairs on back of culm-sheaths reddish-brown.....**Dendrocalamus**
2 Internodes hollow; hairs on back of culm-sheath absent or (*Teinostachyum*) black.
3 Leaf sheath bristly at apex. Ligule of culm-sheath auricled, with 1-2 bristles.....**Ochlandra**
3 Leaf sheath glabrous at apex. Ligule of culm-sheath not auricled.
4 Blade of culm-sheath triangular, ovate, scabrous-brown on the inside....**Bambusa**
4 Blade of culm-sheath linear, glabrous on the inside.....**Teinostachyum**
1 Culm not woody, leaves not reduced to culm-sheaths.
5 Leaves tessellately veined.....**Centotheca**
5 Leaves not tessellately veined.
6 Spikelets with unisexual flowers; the female spikelets solitary at base of inflorescence enclosed in a stony, polished, cylindrical, utricle-like bract.....**Coix**
6 Spikelets with bisexual flowers, not solitary nor enclosed in a bract.
7 Inflorescence feathery (spikelets covered by silky, non-bristly hairs).
8 Rachis continuous.....**Imperata**
8 Rachis disjointing.....**Saccharum**
7 Inflorescence not feathery (spikelets not covered by silky hairs).
9 Inflorescence a simple, unbranched raceme or spike with each spikelet or its pedicel arising directly from the central axis.
10 Spikelets subtended by bristles longer than spikelets.
11 Spikelets ellipsoid, 2-3 mm long.....**Setaria**
11 Spikelets lanceolate, 6-7 mm long.....**Pennisetum**
10 Spikelets not subtended by bristles.
12 Spikelets (glumes and/or lemmas) awned; awns much longer than spikelets.
13 G1 with tubercles or hooks on the back and margin at base.....**Manisuris**
13 G1 without tubercles or hooks.
14 Awns not twisted in lower third.
15 Awns 3-many per spikelet, arising from lemmas.....**Tripogon**
15 Awns 1-2 per spikelet, arising from glumes.
16 Awns 2 per spikelet.....**Perotis**
16 Awn 1 per spikelet.....**Pogonatherum**
14 Awns twisted in lower 1/3 or 1/2.

17 Plants tiny (up to 10 cm); awns (lemmas) 3-many per spikelet.....**Indopoa**
17 Plants over 10 cm; awns (lemmas) 2 per spikelet.
18 G1 flattened and channelled on back; awns minutely ciliate.....**Sehima**
18 G1 rounded and smooth on back; awns densely pubescent.....**Heteropogon**
12 Spikelets unawned or if with cusp then cusp shorter than spikelets.
19 Spikelets sunk in the hollows of rachis.
20 Plants densely tufted, not more than 6 cm.....**Oropetium**
20 Plants spreading by rooting at lower nodes, 15-25 cm tall.....**Lepturus**
19 Spikelets not sunk in the hollows of rachis.
21 Spikelets in groups of two, one sessile and globose.....**Hackelochloa**
21 Spikelets solitary, all pedicelled or all sessile (not globose).
22 G2 with hooked spinules.....**Tragus**
22 G2 without hooked spinules.
23 Flowers 1 per spikelet.
24 Lemma acute; spikelets secund.....**Microchloa**
24 Lemma 4-lobed; spikelets not secund (unawned form).....**Tripogon**
23 Flowers 3-many per spikelet.
25 Lemmas strongly keeled on back, narrowly winged on keel.....**Dactyloctenium**
25 Lemmas not keeled, not winged.....**Eragrostiella**
9 Inflorescence compound, variously branched with spikelets 2 or more per branch (branches pedicel-like in *Coelachne* and *Sacciolepis*).
26 Inflorescence clearly paniculate.
27 Spikelets awned; awns much longer than spikelets.
28 Lemma 3-awned from tip.....**Aristida**
28 Lemma 1-awned from tip; awn sometimes subtended by 2 small setae.
29 Spikelets in groups of 2-3 with one sessile.
30 Tip of rachilla glabrous.....**Capillipedium**
30 Tip of rachilla fulvous-hairy.....**Chrysopogon**
29 Spikelets as above but with all at least shortly pedicelled.
31 Lemmas 2 per spikelet.
32 L2 bearded on the sides above the middle.....**Jansenella**
32 L2 not bearded.....**Arundinella**
31 Lemma 1 per spikelet.
33 Plants aquatic or paludose; glumes reduced to 1/4 the spikelet.....**Oryza**
33 Plants not aquatic; glumes equaling spikelet.....**Garnotia**
27 Spikelets unawned or if with cusp then cusp shorter than spikelets.
34 Glumes reduced to cupuliform structures; lemma tuberculate.....**Leersia**
34 Glumes not reduced or only G1 reduced to 1/3 spikelet; lemma not tuberculate.
35 Flowers 3-many per spikelet.
36 Rachilla white-ciliate.....**Phragmites**
36 Rachilla not white-ciliate.....**Eragrostis**
35 Flowers 1-2 per spikelet.
37 Lemma 1 per spikelet (1-flowered).....**Sporobolus**
37 Lemmas 2 per spikelet (2-flowered).
38 Spikelets subtended by bristles on the pedicel.....**Setaria**
38 Spikelets not subtended by bristles.
39 Panicle cylindrical, dense.
40 Glumes unequal.....**Sacciolepis**
40 Glumes subequal.....**Coelachne**
39 Panicle open.

41 Glumes equaling each other.....**Isachne**
41 Glumes unequal, G1 clearly shorter than G2.
42 Spikelets asymmetrical, obliquely ovate, gibbous, laterally compressed.....**Cyrtococcum**
42 Spikelets symmetrical, not gibbous, not compressed.....**Panicum**
26 Inflorescence of digitate, whorled or alternate, crowded spikes or racemes (racemes short, crowded in *Coelachyrum*).
43 Inflorescence interrupted by spathes.
44 Leaves aromatic; spathe enclosing a pair of racemes.....**Cymbopogon**
44 Leaves non-aromatic; spathe not enclosing a pair of racemes.
45 G1 pitted on the back, above the middle.....**Eremopogon**
45 G1 not pitted.
46 Involucre of modified, usually sterile, spikelets present at the base of fertile spikelet.....**Themeda**
46 Involucre of modified spikelets absent.....**Apluda**
43 Inflorescence not interrupted by spathes.
47 Spikelets in groups of 2 or 3, 1 sessile and 1-2 pedicelled, sometimes reduced to pedicel
48 Blade long-petioled.....**Spodiopogon**
48 Blade sessile or only the lower ones petioled.
49 Sessile spikelet accompanied by only a pedicel.
50 Awn in L2 from apex.....**Apocopis**
50 Awn in L2 from base.....**Arthraxon**
49 Sessile spikelet accompanied by a pedicelled one.
51 Spikelets (sessile and pedicelled) dissimilar.
52 G2 with row of marginal tubercles.....**Vetiveria**
52 G2 without tubercles.
53 Glumes broadly rounded or emarginate-truncate.
54 Glumes broadly rounded.....**Dichanthium**
54 Glumes emarginate.....**Lophopogon**
53 Glumes acute.
55 G1 of sessile spikelet in lower half hardened, smooth, tuberculate or rugose, often winged.....**Ischaemum**
55 G1 of sessile spikelet not hardened, not tuberculate nor rugose, wingless .....**Bothriochloa**
51 Spikelets (sessile and pedicelled) similar.
56 Awns from L2 always basal.....**Arthraxon**
56 Awns from L2 from tip.
57 G2 aristate or shortly awned.....**Pseudopogonatherum**
57 G2 acute, not aristate or awned.....**Eulalia**
47 Spikelets grouped or solitary, but all sessile or all pedicelled.
58 Flowers 3-many per spikelet.
59 Spikelets unawned.
60 Racemes many, densely congested in short heads.....**Coelachyrum**
60 Racemes few, loosely digitate.....**Eleusine**
59 Spikelets awned.
61 Spikelets few (up to 5), separate.....**Melanocenchris**
61 Spikelets many, more or less proximate.
62 Inflorescence spicate, cylindrical.....**Elytrophorus**
62 Inflorescence digitate or umbellate, secund racemes.
63 Racemes reflexed or spreading, in a pyramidal panicle.....**Dinebra**
63 Racemes not reflexed nor spreading, umbelled or digitate, not panicled.

64 Axis of racemes not ending in a mucro; lemma cymbiform, round.....**Chloris**
64 Axis of racemes ending in a mucro; lemma ovoid, acute.....**Dactyloctenium**
58 Flowers 1-2 per spikelet.
65 G1 absent or reduced to a swollen callus.
66 G1 reduced to a swollen callus below spikelet.....**Eriochloa**
66 G1 completely reduced, absent.
67 Spikelet sessile, acute at apex.....**Axonopus**
67 Spikelet shortly pedicelled.
68 L2 with firm involute margin.....**Paspalum**
68 L2 with hyaline, flat margin.....**Digitaria**
65 G1 present, often shorter than the upper glume.
69 Flower (lemma) 1 per spikelet.....**Cynodon**
69 Flowers (lemmas) 2 per spikelet.
70 Upper lemma membranous or hyaline.
71 Spikelet not bearded at base; G2 ciliate along margin.....**Alloteropsis**
71 Spikelet bearded at base; G2 glabrous along margin.....**Dimeria**
70 Upper lemma crustaceous or coriaceous.
72 L2 with an apical, barbellate mucro.....**Urochloa**
72 L2 not mucronate.
73 Glume(s) awned or aristate.
74 Plant aquatic; glume (G2) aristate.....**Pseudoraphis**
74 Plant not aquatic; glume(s) awned.....**Oplismenus**
73 Glume(s) unawned, acute.
75 L1 awned or aristate.....**Echinochloa**
75 L1 not awned, not aristate.
76 Ligule absent.....**Echinochloa**
76 Ligule present.
77 Spikelets laterally compressed, obliquely ovate; G2 boat-shaped.....**Pseudechinolaena**
77 Spikelets more or less dorsally compressed; spikelets not obliquely ovate; G2 rounded on back.
78 Spikelets dorsally compressed; G1 toward the rachis.....**Brachiaria**
78 Spikelets not compressed, convex on ventral side; G1 away from the rachis.....**Paspalidium**

ALLOTEROPSIS J. Presl ex C. Presl

Annuals or perennials. Culms tufted; blade flat; sheath ciliate along margin or hairy; ligule membranous or fringe of hairs. Inflorescence of racemes, digitately arranged. Spikelets pedicelled, ovate or oblong, acute, deciduous, solitary or paired, 2-flowered. Glumes herbaceous; G1 smaller, acute, 3-nerved; G2 the size of spikelet, ciliate along margin, 5-nerved; L1 paleate or not, similar to G2, except glabrous, 3-nerved; L2 membranous, slightly hardening in fruit, short-awned from tip, 5-nerved, enclosing a bisexual, basally auricled palea of similar texture. Lodicules 2; stamens 3; styles 2; stigmas plumose.

1 Annuals. Base of culm not thickened.....*A. cimicina*
1 Perennials. Base of culm thickened by silky remains of old sheaths.....*A. semialata*

Alloteropsis cimicina (L.) Stapf in Prain, Fl. Trop. Afr. 9: 487. 1919; Gamble, Fl. Madras 1766(1223). 1934; Bor, Grasses India 276. 1960. *Milium cimicinum* L., Mant. Alt. 184. 1771.

Annuals. Culms hairy or not. Blade ovate-lanceolate, with bulbous-based hairs along margins; sheath and ligule hairy. Spikelet 6 mm.

Paleotropics. Common in waste places, abandoned fields, across the plains. June-September. *CJS* 14681, 15146.

Alloteropsis semialata (R. Br.) Hitchcock, Contr. U. S. Natl. Herb. 12: 210. 1909; Bor, Grasses India 276. 1960. *Panicum semialatum* R. Br., Prodr. 192. 1810.

Perennials. Blade linear-lanceolate, hairy; sheath hairy along margin; ligule membranous. Spikelet 6 mm.

Tropical Africa, Asia, Australia. This species has so far not been reported for S. India, although it occurs in Sri Lanka. It is common in deciduous forests at Byrapura and the grassy slopes near Yeslur, Uchangi and Balupet. June-August. *CJS* 13441, *HFP* 1726.

APLUDA Linnaeus

Perennial. Blade linear-lanceolate, narrowed at base, sometimes simulating a short petiole. Inflorescence a leafy panicle of reduced racemes, consisting of 1 sessile and 2 pedicelled spikelets, enclosed in a many-nerved, boat-shaped, shortly awned spathe; rachis short, swollen; raceme articulate with tip of peduncle. *Sessile spikelet* bisexual, 2-flowered; glumes chartaceous, subequal; G1 dorsally gibbous, acute at tip, to 7-nerved; G2 linear-oblong, acute; L1 membranous, ovate-lanceolate, acute, with a hyaline 2-keeled palea of similar size, male, rarely bisexual; L2 quadrate, deeply 2-fid with a geniculate awn from sinus or mucronate; its palea shorter, bisexual. Lodicules 2; stamens 3; styles 2; stigmas feathery. *Pedicelled spikelets* 2, often one reduced to a glume; pedicel ciliate. Glumes minutely tuberculate on the back. Lemmas paleate and with male florets.

Apluda mutica L., Sp. Pl. 82. 1753.

var. **aristata** (L.) Hackel ex Backer, Handb. Fl. Java 2: 54. 1928; Bor, Gramineae in Rechinger, Fl. Iranica 524. 1970. *Apluda aristata* L., Amoen. Acad. 4: 303. 1756; Gamble, Fl. Madras 1750(1212). 1934.

Blade 20×1 cm. Spathes 1-2 cm. Glumes 5-6 mm. L2 with awn to 1.8 cm.

Indomalaysia. Common scrambler in exposed terrain of upper Ghats. September-December. *CJS* 9170, 12093.

APOCOPIS Nees

Annuals or perennials. Inflorescence a pair of racemes terminating culm. Spikelet dorsally compressed, imbricate, 2-flowered, sessile, accompanied by a pedicel without spikelet; rachis slender. Glumes subequal, chartaceous; G1 flat, broad, truncate and emarginate at apex, narrowed below; G2 membranous, narrower, 2-keeled. L1 hyaline with a palea of equal size, male or barren; L2 linear, entire or bifid, awned, with a hyaline bisexual palea. Lodicules 0; stamens 2-3; styles 2, free; stigmas plumose.

Apocopis courtallumensis (Steudel) Henrard, Blumea 4: 524. 1941; Bor, Grasses India 95. 1960. *Andropogon courtallumensis* Steudel, Syn. Pl. Glum. 1: 377. 1854. *Apocopis wightii* Nees ex Thwaites, Enum. 365. 1864.

Tufted perennials; culm creeping and rooting at nodes. Blade elliptic, acute, 3.5×0.4 cm, hairy; sheath hairy at mouth; ligule a ciliate membrane. G1 7-nerved, rufous hairy, yellowish near tip. G2 with inflexing margins, hairy below middle. L2 bifid with awn from sinus, 4.2 mm (excluding awn).

S. India, Sri Lanka. Fairly common on grassy slopes and along roads in upper Ghats. July-September. *CJS* 15376, *HFP* 1097.

Note: Thwaites' validation of Nees' name created a superfluous name since he cites "*Andropogon courtallumensis* Steud. Syn. Pl. Glum. 377." as a synonym.

ARISTIDA Linnaeus

Tufted annuals or perennials. Blade involute, narrow; ligule a fringe of hairs. Inflorescence a contracted or effuse panicle. Spikelets shortly pedicelled, bisexual, 1-flowered, disarticulated above glumes; rachilla not produced beyond the floret. Glumes persistent, subequal or unequal, scarious, 1-nerved, usually awned, sometimes mucronate; lemma narrow, cylindrical, indurated at maturity, 1-3-nerved, with a bearded, pungent callus, produced into a 3-branched awn; awn with or without column; palea shorter, bisexual. Lodicules 2; stamens 3; styles 2; stigmas 2, plumose. Grain tightly embraced by lemma, linear; hilum as long as grain.

1 Inflorescence an effuse panicle. Spikelets yellowish at maturity.....*A. hystrix*
1 Inflorescence a contracted panicle. Spikelets green to brown, not yellowish at maturity.
2 Glumes long-awned; awn 4-5 mm.....*A. setacea*
2 Glumes short-awned (2 mm) or not; upper emarginate, mucronate at tip..*A. adscensionis*

Aristida adscensionis L., Sp. Pl. 82. 1753; Bor, Grasses India 407. 1960. *Aristida depressa* auct. non Retz: Gamble, Fl. Madras 1809 (1252). 1934.

Tufted perennial. Leaves to 24 cm long. G1 8 mm with a 1 mm long awn. G2 1 cm, emarginate with a mucro between the lobes. Lemma 1 cm. Lateral awns shorter, central one to 2.5 cm.

Pantropics. Fairly common in the eastern plains. All seasons. *CJS* 13822.

Aristida hystrix L. f., Suppl. Pl. 113. 1781; Gamble, Fl. Madras 1809 (1252). 1934; Bor, Grasses India 412. 1960.

Leaves 50 cm. Glumes long-awned; G1 1-3 cm (including awn); G2 3-4 cm (incl. awn).

Burma to Mascarene Islands. Common in the eastern plains and upper Ghats (Raxidi Estate). All seasons. *CJS* 11924, 15714.

Aristida setacea Retz., Obs. Bot. 4: 22. 1786; Gamble, Fl. Madras 1809(1252). 1934; Bor, Grasses India 412. 1960.

Blade to 50 cm, involute. Glumes long-awned; G1 1.3 cm long (incl. awn); G2 with awn to 1-4 cm.

India to Mascarene Islands. Common in eastern plains. All seasons. *CJS* 17950.

ARTHRAXON Palisot de Beauvois

Annual herbs. Blade ovate-lanceolate, amplexicaul at base; sheath hairy; ligule ciliate. Inflorescence of digitate spiciform racemes; rachis fragile and articulated. Spikelets 2-nate, sessile and pedicelled, both alike, 1-flowered; pedicelled often reduced to the pedicel. Glumes subequal; G1 rounded on the back or 2-keeled; keels tuberculate or not; G2 boat-shaped; L1 hyaline, empty; L2 membranous, convex on the back, subentire, with an awn from base and a hyaline bisexual palea.

1 Pedicel glabrous.....*A. hispidus*
1 Pedicel hairy.
2 Lower glume keeled; keels tuberculate.....*A. meeboldii*
2 Lower glume rounded on the back, not keeled.....*A. lancifolius*

Arthraxon hispidus (Thunb.) Makino, Bot. Mag. Tokyo 26: 214. 1912; Gamble, Fl. Madras 1728(1198). 1934; Bor, Grasses India 99. 1960. *Phalaris hispida* Thunb., Fl. Japon. 44. 1784.

Blade 5 × 1.8 cm, sparsely hairy. Spikelets all sessile; pedicelled reduced to pedicel. G1 rounded, many-nerved; nerves scabrid on the back. G2 ciliate near tip on the keel.

Central & S. Asia. Common, growing on bunds of paddy fields at all elevations. July-October. *HFP* 923, 985.

Arthraxon lancifolius (Trin.) Hochst., Flora 39: 188. 1856; Gamble, Fl. Madras 1729(1198). 1934; Bor, Grasses India 100. 1960. *Andro*

pogon lancifolius Trin., Mem. Acad. Imp. Sci. St.-Petersbourg, ser. 6, 2: 271. 1832.

Slender herbs. Blade to 2×0.5 cm, hairy. Pedicel hairy. G1 rounded on the back with hispid nerves. G2 ciliate on keel toward apex.

Paleotropics. Common on wall cracks and rock crevices at all elevations. August-October. *HFP* 1018, 1103.

Arthraxon meeboldii Stapf, Bull. Misc. Inform. 449. 1908; Gamble, Fl. Madras 1728(1198). 1934; Bor, Grasses India 101. 1960.

Blade to 2×0.5 cm. G1 2-keeled; keels with two rows of marginal tubercles which become spinulose and ciliate upward.

South W. India. Fairly common on walls of Manjarabad Fort. August-September. *HFP* 1016, 1179.

ARUNDINELLA Raddi

Tufted annuals or perennials. Blade flat; sheath usually hairy; ligule hairy or membranous. Inflorescence an effuse or contracted panicle. Spikelets solitary or in unequally pedicelled pairs, 2-flowered. Glumes persistent, unequal, membranous to chartaceous; G1 smaller, acute; G2 acuminate; both 3-5-nerved, bristly or not. L1 similar to G2, to 7-nerved; its palea slightly shorter, male, female or bisexual; L2 firmer than L1, bifid, awned from sinus; lobes awned or not; its palea hyaline, 2-keeled, bisexual. Lodicules 2; stamens 3; styles 2; stigmas 2, plumose.

1 Tip of the pedicel with 2 bristles.....*A. setosa*
1 Tip of the pedicel without any bristles.
2 Glumes with many tubercle-based bristles on the back.....*A. ciliata*
2 Glumes without any bristles, sometimes sparsely hairy.
3 Panicle contracted. Axis of inflorescence scabrid.....*A. purpurea*
3 Panicle fan-shaped, effuse, not contracted. Axis not scabrid.
4 Panicle fan-shaped. Spikelets minute, less than 3 mm, green.....*A. pumila*
4 Panicle effuse. Spikelets more than 3 mm, often purple.....*A. nepalensis*

Arundinella ciliata (Roxb.) Nees ex Miq., Verh. Kon. Ned. Inst. Wetensch. 3(4): 30. 1851; Bor, Grasses India 421. 1960. *Holcus ciliatus* Roxb., Fl. Ind. 1: 321. 1820. *Arundinella holcoides* auct. non Trin.: Gamble, Fl. Madras 1801(1247). 1934.

Annuals. Blade 11.25×0.5 cm, hairy. Panicle compact. Glumes with bulbous-based hairs.

South W. India. Common along road cuts, rock crevices and mountain peaks along the Ghats. September-December. *CJS* 15760, *HFP* 941.

Arundinella nepalensis Trin., Gram. Panic. 62. 1826; Gamble, Fl. Madras 1801(1247). 1934; Bor, Grasses India 423. 1960.

Perennial. Blade 30×1 cm, hairy. Panicle effuse. L2 minutely 2-lobed with awn from sinus.

Indomalaysia. Common in upper and lower Ghats, at mountain peaks and in the valleys, sometimes along river banks. August-December. *CJS* 15581, 15964, *HFP* 983.

Note: A highly variable species. To quote Bor, "The height of the plant varies from a few centimeters to several meters; the thickness of the culm from several millimeters to one centimeter. The panicle varies in length from a few centimeter to half a meter. The spikelets are green, brown or purple, dense or sparse on the branches and let it be remembered that all combinations of these and intermediates between them occur." Many of these variations are found in Hassan plants.

Arundinella pumila (A. Rich.) Steudel, Syn. Pl. Glum. 1: 114. 1854; Gamble, Fl. Madras 1801(1247). 1934; Bor, Grasses India 423. 1960. *Acrantherum pumilum* Hochst. ex A. Rich., Tent. Fl. Abyss. 2: 414 t. 100. 1861.

Delicate annual. Blades 20×2.6 cm, hairy. Panicle fan-shaped; spikelets less than 2 mm long. G2 often with few hairs on back.

Paleotropics. Common on road cuts and mountain peaks at all elevations. September-December. *CJS* 15304, *HFP* 821.

Arundinella purpurea Hochst. ex Steudel, Syn. Pl. Glum. 1: 115. 1854; Bor, Grasses India 424. 1960. *Arundinella fuscata* auct. non Buese: Gamble, Fl. Madras 1802(1247). 1934.

Perennial. Blade 12×1 cm. Panicle contracted; axis and branches scabrid.

South W. India. Rare. Collected only twice, in upper Ghats (Genkalbetta and Panorama Point, Bisle Ghat). October-November. *CJS* 15257, 15305.

Note: The species is remarkable in that the plant dries a peculiar greenish-yellow owing to the aluminum accumulating property.

Arundinella setosa Trin., Gram. Panic. 63. 1826; Gamble, Fl. Madras 1801(1247). 1934; Bor, Grasses India 425. 1960.

Perennial. Blade to 17×0.4 cm, hairy along the margin. Panicle spreading. Spikelets subtended by 2 bristles. L2 1.4 cm (including awn); awn with 2 setae, one on either side.

Indomalaysia. Common in upper Ghats. July-October. *CJS* 9344, 9345, 15007.

AXONOPUS Palisot de Beauvois

Stoloniferous perennial. Blade flat; sheath strongly compressed and keeled on the back; ligule very narrow. Inflorescence of digitate, spiciform, alternate racemes. Spikelets sessile, solitary, alternate, dorsally compressed, acute, 2-flowered, falling entire. G1 absent.

G2 as long as the spikelet, membranous, with involute margin. L1 membranous, faintly nerved, epaleate. L2 herbaceous, involute at margin, hardening in fruit, enclosing a basally auricled, bisexual palea. Lodicules 2; stamens 3; styles 2, free; stigmas plumose.

Axonopus compressus (Sw.) Pal.-Beauv., Ess. Agrost. 12: 154, 167. 1812; Bor, Grasses India 278. 1960. *Milium compressum* Sw., Prodr. Veg. Ind. Occ. 24. 1788.

Blade to 5.5 × 1 cm, rounded at tip, with bulbous-based hairs along margin. Spikelets softly hairy, 2-3 mm.

An introduction from Neotropics. Very common along roads, forming dense mats, in the Ghats. July-September. *CJS* 13872.

BAMBUSA Schreber

Armed or unarmed trees or shrubs, rarely climbing. Culms of various thickness, from a sympodially branching rootstock. Culm-sheaths broad; the imperfect blade usually trigonous. Leaves usually small, rarely large; sheath variously auricled. Inflorescence a pseudopanicle of spikelets in heads, in spicate branchlets or paniculate spikes. Spikelets with 1-many fertile flowers, supported by 1-3 empty glumes. Lemmas oblong, usually mucronate; the palea 2-keeled; keels ciliate or not. Lodicules 3, membranous, ciliate; stamens 6; ovary hairy at tip; style short or elongated; stigmas 1-3, plumose.

Bambusa arundinacea (Retz.) Roxb., Pl. Cor. t. 79. 1796; Gamble, Ann. Roy Bot. Gard. (Calcutta) 7: 51, t. 48. 1896; Fl. Madras 1859(1286). 1934; Holttum, Taxon 8: 67. 1956. *Arundo bambos* L., Sp. Pl. 81. 1753, *nom. conf. Bambos arundinacea* Retz., Obs. Bot. 5: 24. 1788. *Bambusa bambos* Voss in Vilmorin, Blumengart. 1: 1189. 1896.

A large thorny species of great commercial utility. Internodes hollow. Culm sheath broad, triangular, 30 cm wide at base, 20 cm long; ligule narrow with white hairs; blade trigonous, scabrous brown on the inside.

Throughout India. Common, occurring in isolated clumps along roads in the plains and upper Ghats. Flowering very infrequent; collected only twice in flower, on March 14, 1967 (*CJS* 10622) on Hassan-Tiptur road and February 16, 1972 (*HFP* 2582), at Channarayapatna; when in flower, it is often without leaves. *CJS* 10622, *HFP* 2582.

Note: Most authors credit *B. arundinacea* to Willd. (*Sp. Pl.* 2: 245. 1799) but Roxburgh clearly antedates that publication.

BOTHRIOCHLOA Kuntze

Tufted perennials. Inflorescence of spiciform racemes; spikelets

paired, sessile and pedicelled, 2-flowered, deciduous at maturity; rachis and pedicel, both or one translucently channelled. *Sessile spikelets* with subequal glumes; G1 partly membranous, oblong, acute, laterally 2-keeled, to 7-nerved, pitted or not; G2 membranous, acute; L1 hyaline, epaleate, empty; L2 stipiform, white, long-awned from tip; its palea bisexual. Lodicules 2; stamens 3; styles 2; stigmas 2, plumose. *Pedicelled spikelet* with subequal glumes; G1 chartaceous, elliptic-lanceolate, laterally 2-keeled narrowly infolding at margin; G2 membranous, 3-nerved. Lemma(s) hyaline, paleate or not, male.

Bothriochloa concanensis (J. Hooker) Henrard, Blumea 3: 457. 1940; Bor, Grasses India 106. 1960. *Andropogon concanensis* J. Hooker, Fl. Brit. India 7: 174. 1896.

Blade to 20 cm, infolding on margin, hairy on the inside; sheath rounded at mouth; ligule hairy on the inside. Rachis and pedicel white-ciliate. Keels on G1 minutely ciliate; G2 ciliate along margin, 3-nerved.

South W. India. Common in upper Ghats, on the banks of rivers and river beds (Jayaparvathi and Yettinahalla). November-April. *HFP* 220, 2778.

BRACHIARIA Grisebach

Annuals or perennials. Blade flat; sheath hairy or glabrous; ligule of fine hairs. Inflorescence of erect or horizontally spreading racemes; rachis triquetrous. Spikelets shortly pedicelled deciduous, oblong to oval, 2-flowered. G1 & G2 membranous, unequal, G1 shorter; L1 like G2; its palea male or empty; L2 smooth or rugose, hardening in fruit, enclosing a bisexual, basally auricled palea. Lodicules 2; stamens 3; styles 2; stigmas 2, plumose.

1 Spikelets softly hairy all over; upper lemma smooth.....*B. eruciformis*
1 Spikelets glabrous; upper lemma rugose.....*B. miliiformis*

Brachiaria eruciformis (Smith) Griseb. in Ledebour, Fl. Ross. 4: 469. 1853; Gamble, Fl. Madras 1769(1226). 1934; Bor, Grasses India 283. 1960. *Panicum eruciforme* Smith in Sibth. & Smith, A. Graeca 1: 44, t. 59. 1806.

Annuals. Blade to 3.5 × 0.5 cm, glabrous; sheath hairy on nodes, ciliate on margin. Racemes erect, curving with age. G2 softly hairy on the back.

India to Mediterranean. Common, along roads in the open and in paddy fields across plains and upper Ghats. November-April. *CJS* 15717, *HFP* 1612.

Brachiaria miliiformis (Presl) A. Chase, Contr. U. S. Natl. Herb. 22: 35. 1920; Gamble, Fl. Madras 1769(1226). 1934. *Panicum miliiforme* J. Presl in C. Presl, Rel. Haenk. 1: 300. 1830.

Annual or perennial. Blade to 6×0.7 cm, glabrous or sparsely hairy. Racemes horizontal. Spikelets oblong-obovate, broadest near middle, tapering abruptly to a sharp point. L2 rugose on the back, hardening in fruit.

Indomalaysia. Common across plains and upper Ghats. Growing in shade. July-September. *HFP* 327, 345.

CAPILLIPEDIUM Stapf

Tufted perennials; nodes hairy. Blade lanceolate, acuminate, narrowed at base, sheath glabrous or hairy; ligule membranous, ciliate. Inflorescence a contracted panicle of spiciform racemes; spikelets 3-nate, one sessile and 2 pedicelled, deciduous; rachis of raceme and pedicel longitudinally grooved and hairy. *Sessile spikelet* bearded at callus, 2-flowered. G1 herbaceous, to 13-nerved, with narrowly incurved margin, depressed, flat or pitted; G2 boat-shaped, acute, keeled with 2 grooves on either side. L1 hyaline, epaleate. L2 stipiform, with geniculate awn from tip, paleate or not. Lodicules 2; stamens 3; styles 2; stigmas 2, plumose. *Pedicelled spikelet* unlike sessile, unawned; G1 many-nerved, keeled toward margin; G2 boat-shaped, acute; L1 & L2 often wanting, when present male or barren.

Capillipedium huegelii (Hackel) Stapf, Hooker's Icon Pl. t. 3085. 1922; Gamble, Fl. Madras 1730(1199). 1934; Bor, Grasses Ind. 211. 1960. *Andropogon huegelii* Hackel in A. and C. DC., Monogr. Phan. 6: 492. 1889.

Culm scrambling over bushes. Blade 14×0.6 cm. G1 2-keeled, bristly ciliate on keels.

South W. India. Occasional in upper Ghats. Grows on moist sandy soil along streams (Bannuhalla, Yettinahalla). October-April. *CJS* 15755, *HFP* 1524.

CENTOTHECA Desvaux

Tufted perennials. Blade flat, tessellately veined, asymmetrical at base. Inflorescence a panicle. Spikelet if 1-flowered, empty lemmas succeeding fertile floret; if many-flowered, florets all bisexual or the uppermost few reduced, laterally compressed, pedicelled; rachilla disarticulating between lemmas, produced to bear a rudimentary lemma. G1 and G2 unequal, membranous, 3-5-nerved, acute, shorter than lemmas. Lemma

oblong, emarginate at apex, minutely mucronate or not, sometimes shortly awned, 5-9-nerved, glabrous or with bulbous-based, reflexed hairs on the back toward margin; palea shorter, 2-keeled, keels ciliolate. Lodicules 2, cuneate; stamens 2; styles 2, free; stigmas 2, plumose.

Centotheca latifolia (Osbeck) Trin., Fund. Agrost. 141. 1820; de Froidville, Blumea 19: 59. 1971. *Holcus latifolius* Osbeck, Dagb. Ostind. Resa. 247. 1757. *Cenchrus lappaceus* L., Sp. Pl. ed. 2, 1488. 1763. *Centotheca lappaceus* (L.) Desv., Nouv. Bull. Sci. Soc. Philom. Paris 2: 189. 1810; Gamble, Fl. Madras 1848(1279). 1934; Bor, Grasses India 457. 1960.

Paleotropics. Common in shade in upper and lower Ghats. October-January. *CJS* 15825, *HFP* 1145.

Note: The nomenclature of this widespread species is in question because Trinius (1820) indicated that *Centotheca* had but one species, "*latifolia* (*Cenchrus latifolius* Linn.)". Bor (1960) considers this combination, *C. latifolius,* as based solely on *Cenchrus lappaceus* and hence superfluous and illegitimate. Monod de Froideville (1971) argues that Trinius knew the basionym was *Holcus latifolius* Osbeck, because he used *latifolia* here and cites *Holcus latifolius* in a later (1831) work. The fact that Trinius (1820) did not cite his basionym is not as impressive as the fact that "*latifolia*" is the priorable epithet for the species of this monotypic genus and that Trinius eventually does cite the basionym.

CHLORIS Swartz

Annuals or perennials. Culms erect or ascending; blade ovate to linear-lanceolate; ligule hairy or membranous. Inflorescence of digitate or umbelled spikes; spikelet sessile, or very shortly pedicelled, 1-5-flowered; the first 1-2 florets bisexual, the following male or barren; rachilla disarticulating between lemmas, produced, bearing 1-3 barren lemmas; callus often bearded. G1 and G2 herbaceous, persistent, glabrous, 1-nerved; G1 much the smaller. Fertile lemma 3-nerved, ciliate along margin, hairy on the back, shortly bifid at apex, awned; its palea 2-keeled, bisexual; keels minutely scabrid. Lodicules 2; stamens 3; styles 2 free; stigmas 2, plumose. Barren lemmas smaller, cuneiform, glabrous, hairy toward apex, awned from tip, epaleate.

1 Peduncle below the inflorescence hairy.....*C. montana*
1 Peduncle below the inflorescence glabrous.....*C. barbata*

Chloris barbata Sw., Fl. Ind. Occid. 1: 200. 1797; Gamble, Fl. Madras 1838(1272). 1934; Bor, Grasses India 465. 1960.

Annuals ? Barren lemmas 2.

Indomalaysia. Common across the plain. July-December. *CJS* 15703.

Chloris montana Roxb., Fl. Ind. 1: 331. 1820; Gamble, Fl. Madras 1838(1272). 1934; Bor, Grasses India 466. 1960.

Perennials. Barren lemmas 3.
India, Sri Lanka. Common in the plain. July-December. *CJS* 15349.

CHRYSOPOGON Trinius

Tufted perennials, sometimes rhizomatous; blade flat or conduplicate; ligule a ciliate rim. Spikelets in panicles of whorled branches, 3-nate, 1 sessile and 2 pedicelled, deciduous from the thickened, hairy, oblique apices of peduncles. *Sessile spikelet* laterally compressed, 2-flowered; glumes subequal, chartaceous; G1 1-2-keeled, hairy or not on keels, awned or not; G2 boat-shaped, acute, hairy or glabrous; L1 hyaline, male or barren; L2 bisexual, with a geniculate awn. *Pedicelled spikelets* dorsally compressed; L1 and L2 hyaline, empty or enclosing a male floret.

1 Pedicels half as long as the spikelet or longer.
2 Pedicels glabrous.....*C. aciculatus*
2 Pedicels rufous hairy.....*C. orientalis*
1 Pedicels less than half as long as the spikelet.
3 Lower glume awned, rufous hairy on the back.....*C. fulvus*
3 Lower glume acute, glabrous, polished.....*C. hackelii*

Chrysopogon aciculatus (Retz.) Trin., Fund. Agrost. 188. 1820; Gamble, Fl. Madras 1738(1205). 1934; Bor, Grasses India 115. 1960. *Andropogon aciculatus* Retz., Obs. Bot. 5: 22. 1789.

Rhizome subterranean, creeping. Leaves mostly basal, to 2.2×0.35 cm, rounded at tip, glabrous; sheath margin ciliolate. Callus pungent, as long as spikelet.

Tropical Asia. Common, especially toward upper and lower Ghats. This species withstands grazing and fire very successfully due to the subterranean rhizome. August-October. *CJS* 14014, *HFP* 312.

Chrysopogon fulvus (Sprengel) Chiovenda, Fl. Somal. 1: 327. 1929; Bor, Grasses India 116. 1960. *Pollinia fulva* Sprengel, Pugill. 2: 10. 1815. *Chrysopogon montanus* Trin. ex Sprengel, Neue Entdeck 2: 93. 1821; Gamble, Fl. Madras 1739(1205). 1934.

Tufted perennial. Culm base thickened with white hairs. Leaves to 2×0.2 cm, hairy toward base. G2 of sessile spikelet keeled, pectinate-ciliate in the lower 2/3 with golden brown rigid hairs.

Tropics of Asia & Africa. Common in the eastern plains. July-August. *CJS* 15017, *HFP* 1093.

Chrysopogon hackelii (J. Hooker) Fischer in Gamble, Fl. Madras 1739(1205). 1934; Bor, Grasses India 117. 1960. *Andropogon hackelii* J. Hooker, Fl. Brit. India 7: 194. 1896.

Tall perennial herbs. G1 of pedicelled spikelet not awned. Blade flat, to 50×0.8 cm, acuminate; sheath more or less keeled on back.

South Indian Hills. Common in the Ghats. August-October. *CJS* 15306, *HFP* 940.

Chrysopogon orientalis (Desvaux) A. Camus in Lecomte, Fl. Gen. Indo-Chine 7: 332. 1922; Gamble, Fl. Madras 1739(1205). 1934; Bor, Grasses India 118. 1960. *Rhaphis orientalis* Desvaux, Opusc. 69. 1831.

G1 and G2 of pedicelled spikelets awned; leaves mostly basal.

Indomalaysia. Common in the eastern plains. November-December. *HFP* 1023, 1098.

COELACHNE R. Brown

Annuals; blade flat or rolled. Inflorescence an open or contracted, spiciform panicle. Spikelets 2-flowered, terete, muticous; rachilla articulated above glume, elongate between lemmas; G1 and G2 subequal, membranous, suborbicular, persistent; L1 ovate, acute, ciliate near base or not; its palea membranous, 2-keeled, bisexual. L2 like L1, its palea similar to L1's, ciliate on keel near middle, female or bisexual. Lodicules 2; stamens 3; styles 2, free; stigmas plumose.

Coelachne simpliciuscula (Steudel) Munro ex Bentham in J. Linn. Soc., Bot. 19: 93. 1881; Bor, Grasses India 576. 1960. *Panicum simpliciusculum* Wt. & Arn. ex Steudel, Syn. Pl. Glum. 1: 96. 1854. *Coelachne pulchella* var. *simpliciuscula* (Steudel) J. Hooker, Fl. Brit. India 7: 270. 1896; Gamble, Fl. Madras 1804(1249). 1934.

A delicate marsh grass. Callus of upper lemma glabrous.

Indomalaysia. Common in marshes, in plains and Ghats. June-October. *CJS* 16395, *HFP* 834.

COELACHYRUM Hochstetter & Nees

Annuals or perennials. Inflorescence an open or congested, compact, globose panicle. Spikelets many-flowered; rachis produced between lemmas; G1 and G2 subequal, persistent. Lemmas rounded on the back, 3-5-nerved; nerves hairy or not; palea 2-keeled; keels usually ciliate. Lodicules 2; stamens 3; styles 2, free; stigmas plumose. Grain ovate-oblong, transversely rugose.

Coelachyrum lagopoides (N. Burman) Senaratna, Grasses of Ceylon 79. 1956; Bor, Grasses India 488. 1960. *Cynosurus lagopoides* N. Burman, Fl. Ind. 29. 1768. *Eleusine lagopoides* (N. Burman) Merrill, Philipp. J. Sci. 19: 339. 1921; Gamble, Fl. Madras 1840(1273). 1934.

Inflorescence compact, globose with spikelets crowded on a short rachis. Lemma densely bearded below the middle on the keel and nerves.

S. India, Sri Lanka. Collected only once. Found growing in damp, moist, sandy locality at Hirisave in the eastern plain. July. *CJS* 15334.

COIX Linnaeus

Tufted, tall annuals or perennials. Blade flat, long. Inflorescence terminal; spikelets unisexual; basal female, enclosed in a hard polished utricle-like bract; male spikelets terminal, fascicled in twos or threes. *Female spikelets* 2-flowered; glumes 2, inflated below, contracted into a narrow, cartilaginous cusp or beak; G2 grooved on either side of a median keel; L1 empty; L2 like G2, with broad palea; lodicules 0; stamens 3, rudimentary. *Male spikelet* 2-flowered; glumes 2, herbaceous, lanceolate, acute; G1 many-nerved, laterally 2-winged on keels. Lemmas 2, hyaline, paleate. Lodicules 2, fleshy; stamens 3.

Coix lacryma-jobi L., Sp. Pl. 972. 1753; Gamble, Fl. Madras 1705 (1182). 1934; Bor, Grasses India 264. 1960.

An aquatic robust perennial. Blade tubercled; basal sheaths bristly. Bract in female spikelet polished, smooth, non-striate.

Tropics. Common in upper Shiradi Ghat (Yettinahalla). October-February. *CJS* 12289, 16166.

CYMBOPOGON Sprengel

Aromatic perennials. Blade narrow to very long and broad, green or glaucous. Inflorescence a compound or decompound, sometimes congested panicle, interrupted by spathes that enclose a pair of racemes; one sessile or subsessile and the other pedicelled. Spikelets 2-nate, sessile and pedicelled, at the articulations of fragile rachides; rachis and pedicels hairy. *Sessile spikelet* deciduous, 2-flowered; glumes chartaceous, subequal; G1 flat, wrinkled, or with 1-3 slot-like depressions or grooved on the lower half; margin with winged keels; G2 boat-shaped, keeled upward, narrowly winged on keel. L1 hyaline, sometimes suppressed, epaleate; L2 narrow, cleft into two ciliate lobes, awned or not from sinus; its palea bisexual. Lodicules 2; stamens 3; styles 2; stigmas plumose. *Pedicelled spikelet* more or less acuminate. G1 many-nerved, G2 3-nerved, floret male; stamens 3.

1 Lower glume of sessile spikelet grooved below the middle on the back.....*C. caesius*
1 Lower glume not grooved.
2 Lower glume with 1-3 slot-like depressions.....*C. flexuosus*
2 Lower glume without any slot-like depressions.....*C. nardus*

Cymbopogon caesius (W. Hooker & Arn.) Stapf, Bull. Misc. Inform. 341, 360. 1906; Gamble, Fl. Madras 1757(1217). 1934; Bor, Grasses India 125. 1960. *Andropogon caesius* Nees [in Wight, Cat. nos. 1700a, 1700b, 1833, *nom.*] ex W. Hooker & Arn., Bot. Beechey Voy. 244. 1838.

Blade linear-lanceolate, glaucous; sheath glabrous. Spathes drying brownish-red; panicle drying glaucous-green.

India, N. E. Africa. Common in the eastern plains. November-March. *CJS* 16476, *HFP* 2806. It yields an oil which is not much in demand.

Note: Closely allied to *C. clandestinus* (Steudel) Stapf from which it is distinguished by the more glaucous leaves and the glabrous pedicel.

Cymbopogon flexuosus (Steudel) Watson in Atkinson, Gz. N. W. Prov. India 392. 1882; Gamble, Fl. Madras 1756(1216). 1934; Bor, Grasses India 127. 1960. *Andropogon flexuosus* Nees ex Steudel, Syn. Pl. Glum. 1: 388. 1854.

Blade lanceolate, glaucous; sheath hairy. Inflorescence congested with raceme pairs in masses.

Indomalaysia. Predominant at Nagpuri and surrounding hills, near Arsikere. August-December. *HFP* 609, 1958.

Cymbopogon nardus (L.) Rendle, Cat. Welw. Afr. Pl. 2: 155. 1899; Gamble, Fl. Madras 1754(1216). 1934; Bor, Grasses India 130. 1960. *Andropogon nardus* L., Sp. Pl. 1046. 1753.

A tall perennial. Blade lanceolate, acuminate, glaucous. Lower glume not grooved nor slotted. Panicle often turning purplish under dry conditions.

S. India, Sri Lanka. Common on open slopes of Bisle Ghat. July-September. *HFP* 842. Extensively cultivated elsewhere for the highly prized Citronella oil.

CYNODON Richard ex Persoon *nom. cons.*

Perennial stoloniferous herbs, sometimes rhizomatous; blade flat or complicate; sheath glabrescent; ligule hairy or membranous. Inflorescence of digitate spikes. Spikelets 1-flowered. Glumes persistent, membranous, 1-nerved, acute; G1 much the smaller. Lemma laterally compressed, acute, 3-nerved, hairy; its palea 2-keeled, bisexual. Lodicules 2; stamens 3; styles 2; stigmas plumose.

Cynodon arcuatus J. Presl in C. Presl, Rel. Haenk. 1: 290. 1830; Bor, Grasses India 469. 1960; S. K. Jain, Bull. Bot. Survey India 9: 145. 1967. *Cynodon intermedius* Rangachariyar & Tadulingam,

J. Bombay Nat. Hist. Soc. 26: 304. 1918. *Cynodon dactylon* var. *intermedius* (Rangachariyar & Tadulingam) C. Fischer in Gamble, Fl. Madras 1835(1270). 1934.

Stoloniferous herb; blade flat, lanceolate, acuminate, margin scaberulous. Sheath glabrous; ligule membranous, sometimes shortly ciliate. Hairs on the lemma clavellate.

Indomalaysia. Common across plains and the Ghats. Closely allied to *C. dactylon,* which is expected, but differs from it in having a membranous ligule instead of a ring of white hairs. July. *CJS* 14041, *HFP* 2844.

CYRTOCOCCUM Stapf

Annuals or perennials. Culms slender or robust, geniculate or ascending; blade linear, lanceolate; ligule membranous. Inflorescence an open, effuse or contracted panicle. Spikelets long to short-pedicelled, obliquely ovate, gibbous, laterally compressed, 2-flowered, deciduous. Glumes 2, membranous; G1 smaller, G2 as long as spikelet or shorter, 3-5-nerved; L1 like G2, barren, rarely narrowly paleate; L2 chartaceous, narrowly boat-shaped, faintly 3-5-nerved, involute at margin, enclosing a narrow palea of similar texture.

1 Pedicels shorter than the spikelets.....*C. oxyphyllum*
1 Pedicels longer than the spikelets.
2 Spikelets 1.75-2 mm long.....*C. deccanense*
2 Spikelets 1.5 mm or less long.
3 Panicle very lax; pedicels long.....*C. accrescens*
3 Panicle contracted; pedicels short.....*C. patens*

Cyrtococcum accrescens (Trin.) Stapf, Hooker's Icon. Pl. t. 3096. 1922; Bor, Grasses India 291. 1960. *Panicum accrescens* Trin., Sp. Gram. Ic. t. 88. 1828.

A doubtful annual with very lax panicle; leaves asymmetrical at base.

Indomalaysia. Collected only once in the lower Shiradi Ghat (Kempuhole). In dense shade with plenty of moisture. August. *CJS* 14625.

Cyrtococcum deccanense Bor, Kew Bull. 10: 255. 1956; Bor, Grasses India 291. 1960. *Cyrtococcum patens* in part, sensu Gamble, Fl. Madras 1786(1237). 1934, not A. Camus.

Annuals or perennials. Panicle somewhat lax; pedicels longer than spikelets.

S. India, Sri Lanka. Collected once in upper Ghats between Chikkanahalli and Arehalli. In shade in moist localities. August. *HFP* 471.

Cyrtococcum oxyphyllum (Steudel) Stapf, Hooker's Icon. Pl. t. 3096. 1922; Gamble, Fl. Madras 1786(1237). 1934; Bor, Grasses India 291. 1960. *Panicum oxyphyllum* Steudel, Syn. Pl. Glum. 1: 65. 1854.

Perennials. Panicle contracted, pilose at point of branching. Pedicel shorter than the spikelet.

Indomalaysia. Common in upper Ghats in forest clearings and cardamom estates. July-October. *CJS* 15626, *HFP* 569.

Cyrtococcum patens (L.) Camus, Bull. Mus. Hist. Nat. (Paris) 27: 118. 1921; Gamble, Fl. Madras 1786(1237). 1934; Bor, Grasses India 292. 1960. *Panicum patens* L., Sp. Pl. 58. 1753.

A robust perennial. Panicle more or less contracted. Pedicels longer than the spikelets.

India, S. E. Asia. Common in forest clearings and glades in the Ghats. July-September. *CJS* 12632, 16283.

DACTYLOCTENIUM Willdenow

Annual or perennial herbs with flat blades. Inflorescence an umbel of digitate spikes, rarely reduced to a solitary one. Spikelets 3-5-flowered, strongly laterally compressed, sessile, in two rows at right angles to the dorsally flattened rachis; rachis mucronate at tip. Glumes persistent or deciduous; G1 smaller, keeled, acute, G2 like G1, its keel ending in a cusp or short awn. Lemma cymbiform, acute, strongly keeled on back; keel narrowly winged; palea hyaline, winged on keels. Lodicules 2; stamens 3; styles 2; stigmas plumose.

Dactyloctenium aegyptium (L.) Pal.-Beauv., Ess. Agrost. 15. 1812; Gamble, Fl. Madras 1840(1273). 1934; Bor, Grasses India 489. 1960. *Cynosurus aegyptius* L., Sp. Pl. 72. 1753.

Annual with erect culm; blade flat, pilose or glabrous, with bulbous-based hairs toward base. Spikes 1-5; axis ending in a mucro.

Paleotropics. Common in plains and Ghats. July-November. *CJS* 14224, *HFP* 346.

DENDROCALAMUS Nees

Unarmed shrubs or small trees; culm erect from branching root stock; sheath often large, elongate, variably auricled. Blade narrowly linear, of differing sizes, often with pellucid glands. Inflorescence a compound panicle; spikelets in congested heads, ovate, acute, few-flowered, usually bisexual. Empty glumes at base 2-3, many-nerved, ovate, acute or mucronate. Lemma like glumes; palea acute, truncate or emarginate or cleft at tip; those of lower flowers keeled and ciliate, of upper rounded and glabrous. Lodicules 0; stamens 6; style usually hairy; stigma single.

Dendrocalamus strictus (Roxb.) Nees, Linnaea 9: 476. 1834; Gamble, Ann. Roy. Bot. Gard. (Calcutta) 7: 78, t. 68-69. 1896; Gamble, Fl. Madras 1858(1286). 1934. *Bambosa stricta* Roxb., Pl. Cor. t. 80. 1798.

Culm-sheath triangular, with brown shining hairs on the back; ligule narrow, minutely hairy; blade trigonous, acute and pungent at tip, hairy. Blade narrow, small, deciduous; sheath glabrous with narrow ligule.

Dry hills of India, Burma. Occasional in hilly tracts in eastern plains (Nagpuri). It is the most commonly used species (mostly for shafts, mats and baskets), known as the "male bamboo." The species has not been collected in flower. *HFP* 2691.

DICHANTHIUM Willemet

Tufted perennials with narrow blades. Inflorescence of 1-many, many-jointed, articulate, spiciform racemes. Spikelets dorsally compressed, 2-nate, sessile and pedicelled, alike in shape and size, but differing in sex, the lowest pair male or neuter. *Sessile spikelet*: G1 the size of spikelet, many-nerved, the back flat, rounded at tip, margin inflexed, hyaline, sometimes 2-keeled in upper half; G2 as long as or shorter than G1, boat-shaped, keeled. L1 shorter than G1, thinly membranous, epaleate. L2 reduced to a stipe, awned from tip, rarely paleate, bisexual. Lodicules 2; stamens 3; styles 2, free; stigmas plumose. *Pedicelled spikelet*: male, unawned; G1 like G1 of sessile spikelet, G2 not boat-shaped; L1 when present shorter than glumes; L2 rarely present.

1 Peduncle below inflorescence glabrous.....*D. annulatum*
1 Peduncle below inflorescence hairy.....*D. aristatum*

Dichanthium annulatum (Forskal) Stapf in Prain, Flora Trop. Afr. 9: 178. 1917; Gamble, Fl. Madras 1741(1206). 1934; Bor, Grasses India 133. 1960. *Andropogon annulatus* Forskal, Fl. Aegyp.-Arab. 173. 1775.

Culm nodes usually bearded; leaf sheath terete; ligule longish, not ciliate. G1 of pedicelled spikelet glabrous, of sessile spikelet without wings on keels.

India, Burma, Tropical Africa. Occasional. Collected only once in plains at Arkalgud. March. *HFP* 1343.

Dichanthium aristatum (Poiret) C. Hubbard, Bull. Misc. Inform. 654. 1939; Bor, Grasses India 134. 1960. *Dichanthium nodosum* Willemet, Ann. Bot. (Usteri) 18: 11. 1796; Gamble, Fl. Madras 1741(1207). 1934, *nom. illegit.* *Andropogon aristatus* Poiret in Lam., Encycl. Suppl. 1: 585. 1810.

Recognized easily by the hairy peduncle.

Central & S. India. Common in the eastern plains. December-March. *CJS* 16306, *HFP* 1268.

DIGITARIA Heister ex Fabricius

Annuals or perennials with erect, ascending or creeping culms and flat blades; leaf-sheath usually separating from culm. Inflorescence of 2-many, digitate or subdigitate, spaced and alternate or whorled (sometimes more than one whorl) spiciform racemes. Spikelets pedicelled (often unequally) or subsessile, 2-flowered, articulated at the tip of the thickened pedicel; G1 absent; G2 variable in length, glabrous or hairy, rarely absent; L1 the size and shape of spikelet, rarely shorter, 5-9-nerved, otherwise like G2, usually epaleate; L2 membranous, slightly indurated in fruit, glabrous, often brown or purple at maturity, tightly enclosing a similar palea. Lodicules 2; stamens 3; styles 2; stigmas plumose.

1 Hairs on the spikelet neither verrucose nor clavate.....*D. ciliaris*
1' Hairs on the spikelet verrucose or clavate.
2 Hairs verrucose.
3 Tufted annuals.....*D. violascens*
3 Creeping perennials rooting at nodes.....*D. longiflora*
2 Hairs clavate-tipped.
4 Upper glume absent.....*D. stricta*
4 Upper glume present.
5 Tip of pedicels hairy.....*D. ternata*
5 Tip of pedicels glabrous.....*D. abludens*

Digitaria abludens (Roemer & Schultes) Veldkamp, Blumea 21: 53. 1973. *Panicum abludens* Roemer & Schultes, Syst. Veg. 2: 457. 1817. *Paspalum granulare* Trin. ex Sprengel, Neue Entd. 2: 47. 1821. *Digitaria granularis* (Spreng.) Henrard, Monogr. *Digitaria* 302. 1950; Bor, Grasses India 301. 1960. *Paspalum pedicellare* Trin. (ex Steudel, Nom. Bot. ed. 2, 2: 272. 1841, *nom.*) ex J. Hooker, Fl. Brit. India 7: 19. 1896. *Digitaria pedicellaris* (J. Hooker) Prain, Bengal Pl. 1182. 1903; Gamble, Fl. Madras 1765(1223). 1934.

Annuals with subdigitate, spaced racemes. Spikelets unequally pedicelled with clavate hairs. L2 brownish-red at maturity.

Tropical Asia. Common across plains, in shade of shrubs, on loose sandy soil. July-October. *CJS* 17883, *HFP* 479.

Digitaria ciliaris (Retz.) Koeler, Descr. Gram. Gallia et Germania 27. 1802; Blake, Proc. Roy. Soc. Queensland ser. 2, 81: 14. 1969. *Panicum ciliare* Retz., Obs. Bot. 4: 16. 1786. *Panicum adscendens* H., B. & K., Nov. Gen. Sp. 1: 97. 1816. *Digitaria fimbriata* Link, Hort. Berol. 1: 226. 1827. *Digitaria adscendens* (H., B. & K.) Henrard,

Blumea 1: 92. 1934; Monogr. *Digitaria* 9. 1950; Bor, Grasses India 298. 1960. *Digitaria marginata* Link var. *fimbriata* (Link) Stapf in Prain, Fl. Trop. Africa 9: 440. 1919; Gamble, Fl. Madras 1764 (1222). 1934.

Annuals. Racemes 2-many, subdigitate, alternate, subwhorled; peduncle hairy at joints.

Pantropical. Common in plains and Ghats along roads and open places. July-October. *HFP* 276, 348.

Digitaria longiflora (Retz.) Pers., Syn. Pl. 1: 85. 1805; Gamble, Fl. Madras 1765(1223). 1934; Henrard, Monogr. *Digitaria* 408. 1950; Bor, Grasses India 302. 1960. *Paspalum longiflorum* Retz., Obs. Bot. 4: 15. 1786.

Perennials with ovate-lanceolate blades. Racemes digitate.

Paleotropics. Common in plains and Ghats. A widely creeping grass found mostly in sunny places. July-October. *HFP* 326, 1869.

Digitaria stricta Roth ex Roemer et Schultes, Syst. Veg. 2: 474. 1817.

var. **denudata** (Link) Henrard, Monogr. *Digitaria* 175. 1950; Bor, Grasses India 306. 1960. *Digitaria denudata* Link, Hort. Berol. 1: 222. 1827.

Tufted erect annuals with lanceolate, acuminate leaves. Racemes many, alternate; peduncle at joints hairy. L2 purple at maturity.

North India. This taxon which has not so far been reported from S. India might be a new record. Common along roads in moist localities in lower Bisle Ghat. July-August. *HFP* 848.

Note: The typical variety has an upper glume while var. *denudata* lacks it.

Digitaria ternata (A. Rich.) Stapf ex Dyer, Fl. Cap. 7: 376. 1898; Gamble, Fl. Madras 1765(1222). 1934; Bor, Grasses India 306. 1960. *Cynodon ternatus* A. Rich., Tent. Fl. Abyss. 2: 405. 1851.

Annuals. Inflorescence of 2-3 racemes. L2 purple.

Continental Paleotropics. Collected only once near a large tank (Byrapura). July-September. *HFP* 537.

Digitaria violascens Link, Hort. Berol. 1: 229. 1827; Bor, Grasses India 307. 1960. *Paspalum chinense* Nees in Hooker & Arn., Bot. Beechey Voy. 231. 1841. *Digitaria chinensis* (Nees) A. Camus, Not. Syst. 4: 48. 1923, non Hornemann 1819; Gamble, Fl. Madras 1765(1223). 1934.

Tufted, leafy annuals. Racemes 2-3. Hairs on spikelets simple.

Tropics of both hemispheres. Fairly common in lower Bisle Ghat. May. *CJS* 13588.

DIMERIA R. Brown

Tufted annuals or perennials with narrow leaves. Inflorescence of 1-3 spiciform racemes; rachis terete or angled, not articulate. Spikelets solitary, subsessile, articulated on the short pedicel, usually hairy at base, strongly laterally compressed, 2-flowered. Glumes chartaceous or membranous, strongly keeled, subequal or G2 larger; margin and keel sometimes winged. L1 empty, epaleate; L2 hyaline, bifid at tip, awned from sinus; its palea when present hyaline, enclosing a bisexual floret. Lodicules 2 or 0; stamens 2 or 3; styles 2, free; grain linear, compressed laterally.

1 G2 winged.....*D. pubescens*
1 G2 not winged.....*D. ornithopoda*

Dimeria ornithopoda Trin., Fund. Agrost. 167, t. 14. 1820; Gamble, Fl. Madras 1713(1188). 1934; Bor, Grasses India 142. 1960.

A slender tall herb with 2-3 spiciform racemes.

Tropics of Asia extending to Australia. Common in upper Ghats. November-December. *CJS* 15741.

Dimeria pubescens Hackel in A. & C. DC., Monogr. Phan. 6: 83. 1889; Gamble, Fl. Madras 1713(1188). 1934; Bor, Grasses India 144. 1960.

South W. India, Sri Lanka. Fairly common in upper Ghats, in open dry hills (Genkalbetta) or in marshy ground (Raxidi Estate). August-December. *CJS* 15682, *HFP* 1174.

DINEBRA N. Jacquin

Annual, tufted, leafy herbs. Inflorescence of reflexed or spreading racemes usually collected on a narrow pyramidal panicle; spikelets sessile, crowded, secund, 2-seriate, 2-3-flowered; rachilla produced beyond the uppermost lemma to bear an imperfect glume. Glumes persistent, subequal or G2 longer, lanceolate, keeled, curved or cuspidate. Lemmas membranous, shorter, 1-nerved; its palea hyaline, 2-keeled, ciliate on keel. Lodicules 2; stamens 3; styles 2; stigmas plumose.

Dinebra retroflexa (Vahl) Panz., Denkschn. Konigl. Akad. Wiss. Muenchen 4: 270, t. 12. 1814; Gamble, Fl. Madras 1841(1274). 1934; Bor, Grasses India 491. 1960. *Cynosurus retroflexus* Vahl, Symb. 2: 20. 1791.

East Africa to Western India. Common in the eastern plains. Grows in dry fields after harvest. July-September.

ECHINOCHLOA Palisot de Beauvois

Annuals or perennials, with tufted, creeping or floating culm and flat blades. Inflorescence of a panicle of spiciform racemes arranged racemosely or slightly branched; main axis terminating in a few spikelets; spikelets ovate, elliptic, subsessile or shortly pedicelled, 2-flowered, deciduous at maturity; rachilla not produced. G1 and G2 herbaceous; G1 shorter, acute or shortly awned, distinctly nerved; G2 as long as spikelet, oblong, muticous or awned, 5-nerved; L1 like G2, paleate, male or empty. L2 chartaceous or coriaceous, indurating at maturity, convex, smooth, enclosing a basally auricled palea of similar texture. Lodicules 2; stamens 3; styles 2; stigmas plumose.

1 Ligule a fringe of hairs.....*E. stagnina*
1 Ligule none.
2 L1 awned.....*E. crusgalli*
2 L1 at best acute.....*E. colonum*

Echinochloa colonum (L.) Link, Hort. Berol. 2: 209. 1833; Gamble, Fl. Madras 1776(1230). 1934; Bor, Grasses India 308. 1960. *Panicum colonum* L., Syst. Nat. ed. 10, 870. 1789.

Tufted annuals; ligule 0.

Paleotropics. Common in plains and upper Ghats, often in open wastelands, sometimes in marshes. July-October. *CJS* 13746, 15705.

Echinochloa crusgalli (L.) Pal.-Beauv., Ess. Agrost. 53: 161. 1812; Gamble, Fl. Madras 1777(1231). 1934; Bor, Grasses India 310. 1960. *Panicum crusgalli* L., Sp. Pl. 56. 1753.

Annuals or perennials; blade lanceolate; ligule 0. G2 with bristles or nerves; L1 distinctly awned.

Paleotropics. Common in plains; often a weed in paddy fields. All seasons. *CJS* 16090, *HFP* 1820. Fischer (in Gamble, *l.c.*) mentions that the grain is eaten in times of scarcity. It provides a good fodder.

Echinochloa stagnina (Retz.) Pal.-Beauv., Ess. Agrost. 53: 161, 171. 1812; Gamble, Fl. Madras 1777(1231). 1934; Bor, Grasses India 311. 1960. *Panicum stagninum* Retz., Obs. Bot. 5: 17. 1789.

Perennial aquatic grasses with floating, spongy culm; blade with purple cross bands at regular intervals. The inflorescence is generally purplish.

Paleotropics. Common along the margin of the large open tanks in plains. November-March. *CJS* 16899, *HFP* 1300.

ELEUSINE Gaertner

Tufted annuals or perennials; blade usually linear. Inflorescence of digitate or whorled secund spikes, seldom solitary; rachis terminating in a spikelet. Spikelets solitary, sessile, imbricate, strongly laterally

compressed, 3-many-flowered. Glumes persistent, subequal, acute or cuspidate, keeled; G1 1-nerved, G-2 broader, 1-7-nerved; lemmas like glumes, herbaceous, 3-nerved, with the mid-nerve forming a herbaceous keel; plea of similar texture, 2-keeled. Lodicules 2; stamens 3; styles 2, free; stigmas plumose.

1 Peduncle of inflorescence hairy.....*E. coracana*
1 Peduncle of inflorescence glabrous.....*E. indica*

Eleusine coracana (L.) Gaertner, Fruct. 1: 8, t. 1. 1788; Gamble, Fl. Madras 1839(1273). 1934; Bor, Grasses India 492. 1960. *Cynosurus coracana* L., Syst. Nat. ed. 10, 2: 875. 1759.

Paleotropics. Extensively cultivated in the plains and upper Ghats; sometimes occurs as an escape. November-December. *CJS* 14666.

Eleusine indica (L.) Gaertner, Fruct. 1: 8. 1788; Gamble, Fl. Madras 1839(1273). 1934; Bor, Grasses India 493. 1960. *Cynosurus indicus* L., Sp. Pl. 72. 1753.

Paleotropics. Common in plains and upper Ghats, usually in open country and on bunds of paddy fields. July-September. *CJS* 14683, *HFP* 877.

ELYTROPHORUS Palisot de Beauvois

Tufted annuals, with linear leaves and membranous ligules. Inflorescence of sessile, globose clusters of spikelets, in a rachis forming cylindric, often lobed, interrupted spike; spikelets small, laterally compressed, to 6-flowered, often subtended by many empty glumes; rachilla jointed at the base and between the lemmas. Glumes deciduous or persistent, membranous, subequal, both awned; lemmas membranous, ovate-lanceolate, 3-nerved, shortly awned; palea complicate, 2-keeled, hyaline, truncately 3-lobed above, winged on keels; the uppermost lemma usually barren.

Elytrophorus spicatus (Willd.) A. Camus in Lecomte, Fl. Gen. Indo-Chine 7: 547. 1923; Gamble, Fl. Madras 1843(1273). 1934; Bor, Grasses India 493. 1960. *Dactylis spicata* Willd., Ges. Naturf. Freunde Berlin Neue Schriften 3: 416. 1801.

Culms erect with glabrous or minutely hairy linear acuminate blades.

Pantropics. Common in damp situations, in and near paddy fields in plains and upper Ghats. December-February. *CJS* 12260, 16051.

ERAGROSTIELLA Bor

Tufted perennials; leaves mostly basal; blade flat or convolute.

Inflorescence a solitary, terminal, secund spike; spikelets shortly pedicelled, laterally compressed or terete, many-flowered; rachilla articulate between lemmas; glumes 2, deciduous, subequal, ovate, acute, 1-nerved. Lemmas ovate-acute, laterally compressed or not, 3-nerved; palea 2-keeled; sometimes keels winged, often ciliate. Lodicules 2; stamens 3; styles 2, free; stigmas plumose.

Eragrostiella bifaria (Vahl) Bor, Indian Forester 66: 270. 1940; Bor, Grasses India 494. 1960. *Poa bifaria* Vahl, Symb. 2: 19. 1791. *Eragrostis bifaria* (Vahl) Wight ex Steudel, (Nom. Bot. ed. 2, 1: 562, 1840, *nom.*) Syn. Pl. Glum. 1: 264, 1854; Gamble, Fl. Madras 1828(1265). 1934.

Blade involute, sparsely hairy. Spikelet laterally compressed, linear to ovate-oblong, 7×2.2 mm.

India, Burma, Sri Lanka. Common in plains. July-January. *CJS* 13946, *HFP* 2587.

ERAGROSTIS Palisot de Beauvois

Annual or perennial, glandular or eglandular herbs, of various habits, with linear blades. Inflorescence a densely crowded, contracted or effuse and spreading panicle, axis and branches terete or angled, rarely glandular-banded. Spikelets 2-many-flowered, unawned, laterally compressed, long or short-pedicelled, breaking up at maturity either from below upward or from above downward; rachilla zig-zag or straight. Glumes membranous, acute, 1-3-nerved, subequal or G1 smaller, deciduous; lemmas ovate, acute, 3-nerved, more or less overlapping; palea hyaline, 2-keeled, often ciliate on keel or scabrid. Lodicules 2; stamens 3; styles 2, free; stigmas plumose.

1 Lemmas falling from below upward.
2 Plants glandular; glands on the pedicel banded ..... *E. maderaspatana*
2 Plants eglandular.
3 Pedicel with white bands ..... *E. tenuifolia*
3 Pedicel without white bands.
4 Annuals.
5 Spikelets ovate, to ovate-oblong, much compressed; panicle spreading .. *E. uniloides*
5 Spikelets linear; panicle narrow ..... *E. gangetica*
4 Perennials ..... *E. atrovirens*
1 Lemmas falling from above downward.
6 Lemma ciliate along margin ..... *E. deccanensis*
6 Lemma not ciliate.
7 Panicle effuse; plants viscous ..... *E. viscosa*
7 Panicle contracted; plants not viscous.
8 Panicle dense; keels of palea ciliate ..... *E. riparia*
8 Panicle linear; keels of palea non-ciliate ..... *E. diarrhena*

Eragrostis atrovirens (Desf.) Trin. ex Steudel, Nom. Bot. ed. 2, 1: 562. 1840; Bor, Grasses India 503. 1960. *Poa atrovirens* Desf., Fl. Atlant. 1: 73, t. 14. 1798.

Perennial grasses, sometimes glaucous. Panicle more or less effuse; spikelet oblong-acute in outline, 7×2 mm.

Paleotropics. Common in plains and upper Ghats, near tanks and along river banks. July-October. *CJS* 14684, 14728, *HFP* 1026.

Note: This taxon is apparently overlooked by Gamble. It is possibly included under *E. gangetica* (fide Bor, *l.c.* 503).

Eragrostis deccanensis Bor, Grasses India 507. 1960. *Eragrostis phleoides* Stapf ex J. Hooker, Fl. Brit. India 7: 313. 1896, non Hillebrand, 1888. *Eragrostis spicata* Jedwabn., Bot. Arch. 5: 185. 1924, non Vasey, 1891; Gamble, Fl. Madras 1825(1263). 1934.

Tufted perennials, with silvery green spikelets (5×1 mm) crowded in a dense panicle; lemma ciliate along margin.

S. India. Common across plains. November-May. *CJS* 13455, *HFP* 1128.

Eragrostis diarrhena (Schultes) Steudel, Syn. Pl. Glum. 1: 266. 1854; Gamble, Fl. Madras 1826(1264). 1934; Bor, Grasses India 507. 1960. *Poa diandra* Roxb., Fl. Ind. 1: 337. 1820, non R. Br., 1810. *Poa diarrhena* Schultes Mant. 2: 616. 1827.

Tufted perennials with stout, erect culms. Panicle contracted, 30×3 cm. Keels of palea non-ciliate.

Indomalaysia. Occasional, collected on two occasions from adjacent localities in Byrapura. Growing in clayey, marshy soil. July-September. *CJS* 12328, *HFP* 1205.

Eragrostis gangetica (Roxb.) Steudel, Syn. Pl. Glum. 1: 266. 1854; Gamble, Fl. Madras 1826(1264). 1934; Bor, Grasses India 508. 1960.

Annuals. Panicle contracted, 18×1 cm; spikelets linear, 8×1 mm; keels of palea minutely scabrid.

Paleotropics. Occasional; collected only once from marshy soil surrounding tanks near Nagpuri (eastern plains). July. *HFP* 610.

Eragrostis maderaspatana Bor, Grasses India 509. 1960. *Eragrostis willdenowiana* Nees ex J. Hooker, Fl. Brit. India 7: 332. 1896, non Nees ex W. Hooker et Arn., 1838; Gamble, Fl. Madras 1827(1265). 1934.

Tufted, glandular, perennials; margin of blade with conspicuous glands. Panicle spreading, banded by glands; spikelets dark green, linear, 7×1 mm. Keels of palea scabrid.

S. India, Sri Lanka. Rare; collected once at Arsikere (eastern plains). August. *CJS* 16052.

Eragrostis riparia (Willd.) Nees, Agrost. Bras. 512. 1829; Gamble, Fl. Madras 1825(1263). 1934; Bor, Grasses India 513. 1960. *Poa riparia* Willd., Ges. Naturf. Freunde Berlin Neue Schriften 4: 185. 1803.

Tufted perennials, with contracted panicle, sometimes tinged with pink; spikelets oblong, 3 × 1.5 mm.

S. India. Common across plains, in the dry ploughed fields. August-November. *CJS* 15709, 16797.

Eragrostis tenuifolia (A. Rich.) Hochst. ex Steudel, Syn. Pl. Glum. 1: 268. 1854; Gamble, Fl. Madras 1827(1265). 1934; Bor, Grasses India 514. 1960. *Poa tenuifolia* A. Rich., Tent. Fl. Abyss. 2: 425. 1851.

Tufted perennials with dark olive green to blackish spikelets; lemma mucronate.

S. India, Tropical Africa. Common in plains and upper Ghats in open country and on bunds of paddy fields. July-October. *CJS* 14306, *HFP* 534.

Eragrostis uniloides (Retz.) Nees ex Steudel, Syn. Pl. Glum. 1: 264. 1854; Gamble, Fl. Madras 1827(1265). 1934; Bor, Grasses India 515. 1960. *Poa uniloides* Retz., Obs. Bot. 5: 19. 1789.

Tufted annuals with spreading panicle; spikelets white to pink or reddish-purple, ovate, acute, sometimes oblong.

Indomalaysia. Common in plains and Ghats. July-October. *CJS* 13671, *HFP* 847.

Eragrostis viscosa (Retz.) Trin., Mem. Acad. Imp. Sci. St.-Petersbourg ser. 6, 1: 397. 1830; Gamble, Fl. Madras 1826(1264). 1934. *Poa viscosa* Retz., Obs. Bot. 4: 20. 1786.

Perennial viscous tufted plants with spreading (15 × 5 cm), green to purplish panicle.

Paleotropics. Common in plains, usually in dry ploughed paddy fields. October-January. *HFP* 270, 1269.

EREMOPOGON (Hackel) Stapf

Tufted perennials. Inflorescence of spatheate, solitary, spiciform racemes, terminating each branchlet; rachis many-jointed; spikelets 2-nate, sessile and pedicelled, dissimilar excepting the lowest 1-3 pairs of homogamous, male or barren spikelets; callus bearded. *Sessile spikelet*: 2-flowered; glumes subequal, membranous to thinly chartaceous; G1 the size and shape of spikelet, 2-keeled with infolding margin, flat on its back, pitted; G2 herbaceous, boat-shaped; L1 rarely present, hyaline, epaleate;

L2 reduced to stipiform base, awned from tip; its palea hyaline. Lodicules 2; stamens 3; styles 2, free. *Pedicelled spikelet*: unawned, male; lemmas often wanting.

Eremopogon foveolatus (Delile) Stapf in Prain, Fl. Trop. Africa 9: 183. 1917; Gamble, Fl. Madras 1751(1213). 1934; Bor, Grasses India 148. 1960. *Andropogon foveolatus* Delile, Fl. Egypte 16, t. 8, f. 2. 1812.

Culm shortly rhizomatous below; leaves mostly basal, white hairy. L1 of sessile spikelet with a median pit on the back.

India westward to Tropical Africa. Common in the dry rocky terrain at Arsikere, in the eastern plains. September-January. *CJS* 14097, *HFP* 1126.

ERIOCHLOA Kunth

Tufted annuals or perennials, culm shortly creeping at base; blade flat. Inflorescence of spiciform, secund racemes; upper racemes subsessile. Spikelet solitary or fascicled, acute, 2-flowered, articulate with the widened tip of the pedicel, deciduous; base of spikelet thickened and knob-like and forms a cupular rim. G1 wanting or highly reduced and borne on the cupular rim; G2 the size and shape of spikelet, 5-nerved, usually softly hairy; L1 like G2, glabrous, rarely paleate; L2 chartaceous, hardening in fruit, with an apical barbellate mucro or cusp, involute at margin; its palea chartaceous, flat. Lodicules 2; stamens 3; styles 2, free; stigmas plumose.

Eriochloa procera (Retz.) C. Hubbard, Bull. Misc. Inform. 256. 1930; Gamble, Fl. Madras 1767(1224). 1934; Bor, Grasses India 312. 1960. *Agrostis procera* Retz., Obs. Bot. 4: 19. 1786.

Perennials with the thickening at base of spikelet reddish; G1 absent; L2 with a barbellate cusp.

Paleotropics. Collected only from Bourdalboore State Forest (eastern plains). Grows in clayey soil. August-October. *CJS* 15135, *HFP* 1826.

Note: Gamble reduced *Eriochloa polystachya* H., B. & K. to a synonym of *Eriochloa procera* (Retz.) C. Hubbard. However Backer & Bakh. f., (*Fl. Java*) distinguish it from *E. procera*.

EULALIA Kunth

Tufted annuals or perennials; inflorescence of digitately arranged spiciform racemes; rachis long, hairy, slender, many-jointed; joints obliquely articulate; spikelets 2-nate, sessile and pedicelled or in triads,

similar, dorsally compressed, 2-flowered. Glumes subequal, membranous to chartaceous; G1 dorsally flat or depressed with inflexed, keeled margin, hairy below the middle; G2 boat-shaped, keeled, ciliate along margin. L1 often wanting, male; its palea rarely substituting it; L2 stipiform, bifid at tip, with an awn from sinus; its palea usually absent. Lodicules 2; stamens 3; styles 2, free.

Eulalia trispicata (J. A. Schultes) Henrard, Blumea 3: 453. 1940; Bor, Grasses India 157. 1960. *Andropogon tristachyus* Roxb., (Hort. Beng. 6. 1814, *nom.*) Fl. Ind. 1: 261. 1820, non H., B. & K., 1816. *Andropogon trispicatus* J. A. Schultes, Mant. 2: 452. 1824. *Eulalia tristachya* Kuntze, Rev. Gen. Pl. 775. 1891; Gamble, Fl. Madras 1715(1189). 1934.

Perennial. Racemes many; rachis and pedicels white-hairy. G1 white-hairy on keels; G2 with golden brown hairs on the keel.

Indomalaysia. Common, forming large tufts on open slopes of Genkalbetta. September-December. *CJS* 15750, *HFP* 1177.

GARNOTIA Brongniart

Annuals or perennials, sometimes with stout, reedy culms; blade flat, convolute, sometimes trigonous in outline. Inflorescence a panicle; spikelets narrow, lanceolate, terete, bearded at base, articulated on their pedicels, 1-flowered; rachilla not produced beyond the lemma. Glumes membranous, lanceolate, acute, 3-nerved, awned, mucronate or cuspidate. Lemma as long as glumes or shorter, membranous, lanceolate, bifid with an awn from sinus or awned from tip; palea hyaline, 2-nerved with auricled, infolding flaps. Lodicules 2; stamens 3; styles 2, free; stigmas plumose.

1 Blades not articulated on their sheaths, triangular in outline; sheath woolly at tip ..... *G. elata*
1 Blades articulated on their sheaths.
2 Glumes unawned, mucronate ..... *G. stricta*
2 Glumes awned.
3 Perennial tall reedy plants; awns of glumes to 2 mm ..... *G. arundinacea*
3 Annual slender herbs; awns of glumes 4 mm and above ..... *G. arborum*

Garnotia arborum Stapf ex Cooke, Fl. Bombay 2: 1013 (3: 534). 1908; Bor, Grasses India 567. 1960.

A slender tufted delicate annual; glabrous except for the pubescent nodes; lemma long-awned from sinus (awn 1.8 cm).

South W. India. Common in upper Ghats; growing on sand and humus collected on clefts of tree trunks. July-September. *HFP* 900, 1055.

Garnotia arundinacea J. Hooker, Fl. Brit. India 7: 243. 1896; Gamble, Fl. Madras 1812(1255). 1934; Bor, Grasses India 567. 1960.

A weak, reedy, tall perennial with pubescent nodes; blade flat, lanceolate-acuminate (20×2.7 cm); lemma entire, awned from tip.

South W. India. Common in Ghats, along road cuts and forest clearings. October-January. *CJS* 15633, 15780.

Garnotia elata (Miq.) Janowsky, Feddes Repert. Spec. Nov. Regni Veg. 17: 86. 1921; Bor, Grasses India 567. 1960. *Berghausea elata* Arn. ex Miq., Verh. Kon. Ned. Inst. Wetensch. 3: 4, 32. 1851. *Garnotia scoparia* pro parte sensu Gamble, Fl. Madras 1812(1254). 1934.

Stout perennials; culm nodes glabrous, woolly near tip. Lemma with a 'perfect' awn (column twisted with a geniculate bristle).

South W. India. Occasional; collected only once at Chick-Tirupathi, near Arsikere (eastern plains), on rocks. October. *CJS* 15192.

Garnotia stricta Brongn. in Duper., Voy. Coq. Bot. 133, t. 21. 1831; Gamble, Fl. Madras 1812(1225). 1934; Bor, Grasses India 569. 1960.

Tufted annuals; blade hairy; lemma bifid with an awn issuing from the middle.

Indomalaysia. Common in Ghats; on rock crevices and soil collected on clefts of tree trunks. September-January. *HFP* 922, 980.

HACKELOCHLOA Kuntze

Tufted annuals with terminal and axillary, spiciform racemes. Spikelets in pairs, sessile and pedicelled; pairs of spikelets dorsiventrally arranged i.e. all pedicelled spikelets facing one direction, all sessile the other; pedicel completely fused with the adjacent rachis, together forming a cavity. *Sessile spikelet*: globose, 2-flowered; G1 hard, globose, rounded and truncate at tip, to 8-nerved; G2 shorter, narrower, convex, lining the cavity of the joint; L1 hyaline, convex, 3-nerved, epaleate; L2 hyaline, oval, with a similar palea. Lodicules 2; stamens 3; styles 2, free; stigma plumose. *Pedicelled spikelet*: strikingly different from sessile; G1 hard, as long as the spikelet, ovate, acute, margin narrowly incurving, winged on one side; G2 as long, boat-shaped, keeled on back. L1 and L2 often wanting, when present, L2 male.

Hackelochloa granularis (L.) Kuntze, Rev. Gen. Pl. 976. 1891; Gamble, Fl. Madras 1758(1218). 1934; Bor, Grasses India 159. 1960. *Cenchrus granularis* L., Mant. Alt. 575. 1771.

Culms branching; blades lanceolate, cordate at base, hairy; sheath keeled on back, ciliate along margin.

Pantropics. Common in plains and upper Ghats. July-September. *CJS* 15190, 17897.

HETEROPOGON Persoon

Annuals or perennials; culms strongly tufted. Inflorescence a solitary, spiciform raceme terminating culm; spikelets in pairs, sessile and pedicelled, rarely triads; lower pairs alike, the upper ones unlike; rachis many-jointed, not or tardily disarticulating between homogamous spikelets, fragile between the heterogamous. *Fertile spikelet*: 2-flowered; glumes subequal, chartaceous, hardly compressed, sometimes with inrolling margins; G1 hairy and G2 sometimes so. Lemmas hyaline; L1 epaleate, empty; L2 with a stipiform base and a long awn, epaleate. Lodicules 2; stamens 3; styles 2, free; stigmas plumose. *Other spikelets*: unawned, their glumes dissimilar; G1 2-keeled, winged on one or both keels; lemmas often wanting, male, empty.

Heteropogon contortus (L.) Pal.-Beauv. ex Roemer & Schultes, Syst. Veg. 2: 836. 1817; Gamble, Fl. Madras 1743(1208). 1934; Bor, Grasses India 163. 1960. *Andropogon contortus* L., Sp. Pl. 1045. 1753.

Callus of fertile spikelets densely hairy. G1 (of fertile, sessile and male spikelets) hairy, sometimes with tubercle-based hairs. G2 glabrous or with a few apical setae from tubercles.

Pantropics. Common in plains and upper Ghats. July-November. *CJS* 11923, 15745.

IMPERATA Cyrillo

Perennial with creeping, branched rhizome. Inflorescence a contracted, dense, silky panicle with an inarticulate rachis. Spikelets unequally pedicelled, articulate with the tip of pedicel, 1-2-flowered, oblong, muticous; callus at base with long (longer than spikelet) silky hairs. Glumes oblong, acute, chartaceous, 3-9-nerved, covering lemmas, densely hairy from lower half; L1 hyaline, epaleate or absent. L2 sometimes wanting, hyaline, 1-nerved, rarely enervate; its palea hyaline. Lodicules 0; stamens 1-2; styles 2, connate at base.

Imperata cylindrica (L.) Pal.-Beauv., Ess. Agrost. 165. 1812.

var. **major** (Nees) C. Hubbard ex C. Hubbard & Vaughan, Grass. Mauret 96. 1940; Bor, Grasses India 170. 1960. *Imperata koenigii* var. *major* Nees, Fl. Agr. Austr. 90. 1841. *Imperata cylindrica* var. *koenigii* (Retz.) Durand & Schinz, Consp. Fl. Africa 5: 694. 1894; Gamble, Fl. Madras 1707(1184). 1934.

Nodes bearded; leaves flat, lanceolate, sometimes ciliate toward base.

Paleotropics. Common across plains. Often a troublesome, persistent weed. April-July. *CJS* 13558, *HFP* 1824.

INDOPOA Bor

Slender, tufted annuals with linear blades. Inflorescence a slender erect spike; spikelets many-flowered, alternate, subsessile, not articulated on the rachis; rachilla produced between lemmas, not beyond the terminal, jointed at the base. Glumes membranous, 1-nerved, acute; G1 smaller. Lemmas membranous, bearded at base, linear-oblong, 3-nerved; nerves terminating in awns; the central awn twisted and kneed, the laterals shorter; palea hyaline, 2-keeled, glabrous; lodicules 2; stamens 3; styles 2, free; stigmas plumose.

Note: Closely allied to *Tripogon* Roth, differing in having a twisted base and a geniculate bristle to its awn.

Indopoa paupercula (Stapf) Bor, Kew Bull. 12: 225. 1958. *Tripogon pauperculus* Stapf, Hooker's Icon. Pl. t. 2442. 1896 ('*pauperulus*'); Gamble, Fl. Madras 1833(1269). 1934; Bor, Grasses India 522. 1960.

Plant less than 10 cm; blade involute in the dry state.

Maharashtra-Karnataka. Locally common at Genkalbetta (upper Ghats). Grows in tufts on rock surfaces and crevices as well as on moss infested tree trunks and clefts. One of the smallest species recorded for the District. August-September. *CJS* 17978, *HFP* 898.

ISACHNE R. Brown

Annuals or perennials with creeping, ascending or erect culms. Inflorescence a contracted or open panicle; spikelets globose, orbicular, muticous, 2-flowered, articulated above the glumes; pedicel thickened toward tip. Glumes subequal, as long as or shorter than spikelet, herbaceous; G2 usually the wider, 5-9-nerved; lemmas similar or dissimilar in texture, distinctly spaced; L1 membranous to chartaceous, convex, sometimes exceeding glumes and L2; its palea similar, male, bisexual; L2 convex, firmer than L1, paleate, enclosing female bisexual florets. Lodicules 2, minute; stamens 3; styles 2, free; stigmas plumose.

1 Pedicel with white-banded glands.....*I. globosa*
1 Pedicels without glands.
2 Glumes setose.....*I. setosa*
2 Glumes glabrous, hairy or pubescent, not setose.
3 Lemmas similar in outline and structure.....*I. elegans*
3 Lemmas dissimilar in outline and structure.
4 L2 hairy.....*I. dispar*
4 L2 not hairy.....*I. miliacea*

Isachne dispar Trin., Sp. Gram. 1: t. 86. 1828; Gamble, Fl. Madras 1797(1244). 1934; Bor, Grasses India 580. 1960.

Glumes as long as the spikelet, hairy. Lemmas dissimilar; L2 chartaceous, hairy.

Indomalaysia. Common; often a troublesome weed in paddy fields. October. *HFP* 835.

Isachne elegans Dalzell ex J. Hooker, Fl. Brit. India 7: 23. 1896; Gamble, Fl. Madras 1797(1244). 1934; Bor, Grasses India 580. 1960.

Glumes as long as spikelet, glabrous; lemmas similar.

South W. India. Common, often a troublesome weed in paddy fields. January. *CJS* 12303, 15236.

Isachne globosa (Thunb.) O. Kuntze, Rev. Gen. Pl. 2: 778. 1891; Bor, Grasses India 580. 1960. *Milium globosum* Thunb., Fl. Japon. 49. 1784.

Pedicels white gland-banded; glumes shorter than the spikelet; lemmas dissimilar; L1 elliptic, rounded, membranous; upper ovate, acute, chartaceous, tubercled.

Indomalaysia. Rare; collected only once in Holenarsipur (eastern plains). August. *CJS* 16310.

Isachne miliacea Roth, Nov. Pl. Sp. 58. 1821; Gamble, Fl. Madras 1797(1244). 1934; Bor, Grasses India 582. 1960.

Glumes hairy, as long as or shorter than spikelets; lemmas dissimilar; L1 elliptic, membranous; L2 ovate, acute, chartaceous.

Indomalaysia. Common in swamps and marshes in plains and Ghats. August-September. *CJS* 15751, *HFP* 1296.

Isachne setosa C. Fischer, Bull. Misc. Inform. 242. 1932; Gamble, Fl. Madras 1797(1244). 1934; Bor, Grasses India 582. 1960.

Glumes setose, longer than lemmas; lemmas dissimilar; L1 elliptic membranous; L2 orbicular, hairy.

South W. India. Locally common on grassy slopes near Genkalbetta peak (upper Ghats). August-September. *HFP* 1194.

ISCHAEMUM Linnaeus

Annual or perennial herbs with creeping, ascending or erect culms; blade occasionally narrowed and petioled. Inflorescence of 2-many spiciform racemes, arranged digitately; if only 2 racemes, appressed and appearing single; rachis many-jointed. Spikelets 2-nate, (sub) sessile and pedicelled; sessile deciduous with the continuous joint of rachis and pedicelled falling from pedicel. Spikelets similar or dissimilar, usually the pair heteromorphous. G1 oblong or lanceolate, chartaceous, the lower half

often hardened, tuberculate or rugose, many-nerved, entire or bicuspidate at tip, sometimes winged; G2 shorter, narrower, boat-shaped, keeled upward, usually shortly awned; L1 shorter, membranous, narrowed at tip, keeled; its palea hyaline, male; L2 hyaline, entire, 2-fid and awned from sinus, 3-5-nerved; its palea hyaline, bisexual. Lodicules 2; stamens 3; styles 2, free; stigma plumose.

1 Keel of G2 of sessile spikelet narrowly winged at tip and with a tuft of hairs at the base of the keel.....*I. thomsonianum*
1 Keel of G2 not winged.
2 Gl of sessile spikelet with 2-3 marginal, nodular thickenings at the base, on back.....*I. barbatum*
2 Gl of sessile spikelet without any nodular thickening.....*I. indicum*

Ischaemum barbatum Retz., Obs. Bot. 6: 35. 1791; Bor, Kew Bull. 15: 411. 1961. *Ischaemum aristatum* sensu Hackel, non L. var. *barbatum* (Retz.) Hackel in A. & C. DC., Monogr. Phan. 6: 204. 1889; J. Hooker, Fl. Brit. India 7: 127. 1896. *Ischaemum goebelii* Hackel, Oesterr. Bot. Z. 51: 149. 1901; Bor, Grasses India 179. 1960.

Perennial. Racemes 2; Gl of sessile spikelet chartaceous below with marginal nodular thickenings along margin, membranous above, shortly bicuspidate, laterally with narrowly winged keels; G2 chartaceous, boat-shaped, keeled upward, ciliate on keel.

Indomalaysia. Rare; collected only twice, at Byra State Forest and outskirts of Saklespur town, near the junction between main highway and Hanbal road, in small ponds. October-April. *HFP* 1593.

Ischaemum indicum (Houtt.) Merrill, J. Arnold Arbor. 19: 320. 1938; Bor, Grasses India 180. 1960. *Phleum indicum* Houtt., Nat. Hist. II, 13: 198, t. 90, f. 2. 1782. *Ischaemum aristatum* auct. non L.: Gamble, Fl. Madras 1721(1193). 1934.

Racemes 2-3. Callus and pedicel hairy or not. Gl of sessile spikelet chartaceous, broader and involute at base, broadly winged on either side above; G2 winged near tip on the median keel.

S. India. Common in plains and Ghats. August-January. *CJS* 12802, *HFP* 1367.

Ischaemum thomsonianum Stapf ex C. Fischer in Gamble, Fl. Madras 1722(1193). 1934; Bor, Grasses India 185. 1960.

Blade lanceolate, acute-acuminate at tip, sometimes petioled at base. Racemes 2; callus and pedicels hairy. Gl of sessile spikelet broad and infolding below, acute to slightly bicuspidate near tip, densely hirsute on back.

S. India. Common in upper Ghats. September-January. *HFP* 1136, 1180.

JANSENELLA Bor

Weak annual herbs with erect, subscandent culm; blade ovate-lanceolate, cordate and amplexicaul at base; ligule narrow, arch-shaped. Inflorescence a crowded, compact panicle; spikelets 2-flowered; rachilla disarticulating above glumes, not produced beyond the uppermost lemma. G1 thinly membranous, ovate, shortly acuminate; G2 shortly bifid, with a small arista from the sinus. L1 boat-shaped, acute and aristate; its palea membranous, truncate, 2-keeled, bisexual or male; L2 membranous to chartaceous, bilobed, awned from sinus, densely hairy on either side above the middle, bearded at base, turning brown with age; its palea hyaline, elongate, 2-keeled, 2-fid at tip, bearded below. Lodicules 2; stamens 3; styles 2, free; stigmas plumose.

Jansenella griffithiana (C. Mueller) Bor, Kew Bull. 9: 98. 1955; Bor, Grasses India 426. 1960. *Danthonia griffithiana* C. Mueller, Bot. Zeitung (Berlin) 14: 347. 1856. *Arundinella avenacea* Munro ex Thwaites, Enum. 362. 1864; Gamble, Fl. Madras 1801(1246). 1934.

Blade softly hairy; sheath rounded on the back, ciliate along margin.

Burma, India, Sri Lanka. Common. On exposed grassy peaks covering large tracts, occasionally in marshes. August-October. *CJS* 15255, *HFP* 899.

LEERSIA Solander ex Swartz

Perennial aquatic or marsh herbs with creeping rhizomes; culms geniculate and ascending; blade flat or involute, often harshly scabrid. Inflorescence an oblong, spreading panicle; spikelets strongly laterally compressed, imbricate, one-flowered, shortly pedicelled; pedicel with cupuliform, knob-like apex (considered by many as representing rudimentary glumes); articulation above this. Glumes absent. Lemma chartaceous, boat-shaped, muticous, caudate or awned, 5-nerved, spinulose scabrid on nerves; palea like lemma, narrower, 3-nerved. Lodicules 2; stamens usually 6, sometimes less; styles 2, free; stigmas plumose.

Leersia hexandra Sw., Prod. Veg. Ind. Occ. 21. 1788; Gamble, Fl. Madras 1845(1277). 1934; Bor, Grasses India 599. 1960.

Perennial aquatic; nodes pubescent; rachis of spike zig-zag. Lemma unawned.

Pantropics. Common in tanks in the plains; apparently this does not set seeds. All seasons. *CJS* 14309, *HFP* 535.

LEPTURUS R. Brown

Annual or perennial herbs with narrow blades. Inflorescence a terminal, cylindrical spike; spikelets 1-2-flowered, sessile, solitary, alternate or rarely opposite, appressed to or sunken in the hollows of the joints of the readily disarticulating rachis; rachilla disarticulating above glumes. Glumes similar, coriaceous or G1 suppressed; G2 thick, tailed or not. Lemma unawned, membranous or hyaline, with back to rachis, usually shorter than glumes, 3-nerved; palea hyaline. Lodicules 2; stamens 3; styles 2, free; stigmas plumose.

Lepturus radicans (Steudel) A. Camus, Ann. Soc. Linn. Lyon, n.s. 69: 87. 1923; Bor, Grasses India 585. 1960. *Ophiurus radicans* Steudel, Syn. Pl. Glum. 1: 430. 1854.

Annuals with creeping or ascending culm; blade flat, glabrous; ligule membranous, ciliate. Spikelet 1-flowered; G2 not tailed.

East Africa to Sri Lanka. The genus has not been recorded for India. In Sri Lanka it is said to be an introduction. There is no evidence that it is introduced here.

Rare, in shade along a bridge over a stream in Kenchankumri State Forest. July. *HFP* 347.

LOPHOPOGON Hackel

Tufted perennial. Inflorescence of 1-many, usually binate, when more than 2, fascicled, spiciform racemes with fragile, articulated rachis; joints cupular. Spikelets 2-nate, sessile and pedicelled. *Sessile spikelet* 2-flowered; G1 chartaceous, narrowed at base, expanding into a truncate, emarginate, 4-5-toothed apex, to 8-nerved; G2 membranous, lanceolate, acute; its palea linear, empty or male (stamens 2); L2 hyaline, deeply bifid with setiform lobes with an awn from sinus; its palea quadrate enclosing a bisexual, or female floret. Lodicules 0; stamens 2; styles 2; stigmas plumose. *Pedicelled spikelet* 2-flowered; with lower floret (L1) male and the upper (L2) female.

Lophopogon tridentatus (Roxb.) Hackel in Engl. & Prantl, Pflanzenfam. 2(7): 26. 1887; Gamble, Fl. Madras 1724(1195). 1934; Bor, Grasses India 190. 1960. *Andropogon tridentatus* Roxb., Fl. Ind. 1: 261. 1820.

Tufted perennial, white-silky at the base; blade hairy on the inside. G1 bearded on the back with rufous hairs above the middle; G2 laterally hispid-villous.

Central & South W. India. Common in loose sandy or rocky, sunny areas as at the outskirts of Arsikere town (plains). August-October. *CJS* 17910, *HFP* 1125.

MANISURIS Linnaeus

Tufted annuals or perennials with flat, or conduplicate blades. Inflorescence terminal or axillary, of solitary, spiciform racemes; spikelets 2-nate, sessile and pedicelled; rachis and pedicel fused to form a short, truncate, convex internode, excavate on the inner surface which receives the sessile spikelet, deciduous with the sessile spikelet. *Sessile spikelet* dorsally compressed; G1 coriaceous, smooth, variously ornamented in the lower-half; the upper-half keeled, winged, 1-2-awned; G2 membranous to chartaceous, boat-shaped, keeled; L1 hyaline, rarely paleate, male or empty; L2 hyaline, paleate, enclosing a bisexual floret. Lodicules 2; stamens 3; styles 2, free; stigmas plumose. *Pedicelled spikelet* with chartaceous or coriaceous glumes; G1 2-keeled, winged often on one keel; G2 1-keeled and variably winged; L1 and L2 hyaline when present and L2 male, often both wanting.

Manisuris forficulata C. Fischer, Bull. Misc. Inform. 355. 1933; Gamble, Fl. Madras 1761(1220). 1934; Bor, Grasses India 192. 1960.

Tufted annual with flat, hairy blades. G1 of sessile spikelet charta-, ceous, lanceolate, terminated by a pair of unequal divaricate awns, margins with basally acute wing that tapers on to the base of awns; base of glume on the back and margin with 4-5 rows of hooked, apically minutely bearded tubercles.

South W. India. Locally common at Genkalbetta (upper Ghats) on wet rocks. September. *HFP* 896.

MELANOCENCHRIS Palisot de Beauvois

Tufted annuals or perennials with convolute or flat blades. Inflorescence of spikelets in spaced clusters on a simple axis; cluster of spikelet shortly peduncled, secund; spikelet 2-flowered; rachilla jointed at the base, produced beyond the lemmas and bearing 1-2 scales (rudimentary lemma and palea of a 3rd floret). Glumes persistent, subequal; G1 rigid, narrow, densely ciliate along margin, awned; G2 hyaline along margin; lemmas membranous, cymbiform, ovate, 3-nerved, bilobed at tip with an awn from sinus; palea 2-keeled, 2-toothed or bicuspidate; L1 bisexual; L2 male; lodicules 2; stamens 3; styles 2, free; stigmas plumose.

Melanocenchris jacquemontii Jaubert & Spach, Illus. Pl. Or. 4: 36, 325. 1851; Bor, Grasses India 473. 1960. *Melanocenchris royleana* Nees ex Steudel, Syn. Pl. Glum. 1: 218. 1854; Gamble, Fl. Madras 1778(1268). 1934.

Annual; blade convolute, not aggregated at base.

India. Common, in dry, compact sandy terrain as at Belvathally, Arsikere (plains). August-September. *CJS* 13938, 17857.

MICROCHLOA R. Brown

Slender, tufted perennials. Leaves basal; blade subsetaceous, pungent, usually curved. Inflorescence a terminal, secund, curved spike; spikelets 1-flowered, small, alternate, in two rows; rachilla articulated above glumes; glumes more or less persistent, subequal, lanceolate, acute, 1-keeled; lemma hyaline, oblong, mucronate, 3-nerved, densely hairy on nerves, hyaline, as long as lemma, ciliae on keels.

Microchloa indica (L. f.) Pal.-Beauv., Ess. Agrost. 20. 1812; Gamble, Fl. Madras 1830(1267). 1934; Bor, Grasses India 473. 1960. *Nardus indica* L. f., Suppl. 105. 1781.

Plant less than 15 cm in height. Spike slender, curved, purplish.

Pantropics. Common, on hard-surfaced soil at Bourdalboore (plains). September. *HFP* 1092.

OCHLANDRA Thwaites

Reedlike, shrubby, gregarious bamboos. Culms erect, with thin-walled internodes; culm-sheaths thin, more or less persistent, with small auricles. Blade with cartilaginous margin; sheath striate, fringed; ligule usually short. Inflorescence a terminal panicle of spikes; spikelets in verticels, a mixture of fertile and sterile ones, one-flowered, subtended by 2-5 empty persistent glumes; glumes usually mucronate; lemmas like uppermost glumes; paleas membranous, usually convolute, not keeled. Lodicules 1-several; appressed to filaments. Stamens 6-120, with free filaments; style elongate with 4-6 plumose stigmas. Fruit ovoid, long-beaked.

Ochlandra scriptoria (Dennstedt) C. Fischer in Gamble, Fl. Madras 1863(1289). 1934. *Bambusa scriptoria* Dennstedt, Schluessel Hort. Malab. 31. 1818. *Beesha rheedii* Kunth, Enum. 1: 434. 1822. *Ochlandra rheedii* (Kunth) Bentham & J. Hooker ex Gamble, Ann. Roy. Bot. Gard. (Calcutta) 7: 121, t. 107. 1896.

Culms hollow, erect from an extensively branching subterranean rootstock; culm-sheath thin, papery, brownish, trigonous; ligule narrow, auricled with a few caducous bristles; imperfect blade narrow, subuliform, hairy on the inside. Blade linear-lanceolate, acuminate; sheath ciliate along margin; ligule narrow with few caducous bristles. Lodicules many; stamens 15-18 or more, with mucronate anthers. Style cleft into 3 plumose stigmas.

South W. India. Common along sandy river banks in the Ghats. The species has not been found in flower. *HFP* 2601, 2710.

Note: This South Indian species, supposedly with many stamens and many lodicules is not clearly distinguished from *Melocanna baccifera* (Roxb.) Kurz (*Prelim. Report Forest & Veg. Pegu, app.* B 94. 1875; Skeels, *U. S. Dept. Agric. Bur. Pl. Industr. Bull.* 223: 50. 1911) of N. E. India, which is supposed to have 5-7 stamens and 2 lodicules. The S. India species is described under the binomial *Ochlandra rheedii* by Gamble and fertile material is unknown since Rheede (*Hort. Malab.* 5: 119, t. 60. 1685) described *Beesha.* The N. E. Indian species is commonly known as *Melocanna bambusoides* Trin. (in Sprengel, *Neue Entd.* 2: 43. 1821), an illegitimate name based on *Bambusa baccifera* Roxb. (*Pl. Corom.* 3: 38, t. 243. 1815). Roxburgh (*l.c.*) does cite *Beesha* of Rheede in synonymy which all authors seem to be excluding from his taxon.

OPLISMENUS Palisot de Beauvois

Annual or perennial herbs; culms at base creeping. Blade usually ovate with transverse veinlets, often asymmetrical. Inflorescence of spiciform, secund racemes with triquetrous rachis; main axis hairy at joints. Spikelets paired or solitary, 2-flowered, shortly pedicelled, articulate with short pedicel; rachilla articulate at base of L2; glumes 5-7-nerved, ovate-acute, awned; G1 with longest awn; L1 longer than glumes, oblong, unawned, blunt, 5-8-nerved, paleate or not; L2 chartaceous or coriaceous, smooth, hardening in fruit, with inrolling margins; its palea similar in texture, 2-nerved. Lodicules 2; stamens 3; styles 2, short, distant; stigmas plumose.

1 Awn capillary, barbellate.....*O. burmannii*
1 Awn stiff, smooth but viscid.....*O. compositus*

Oplismenus burmannii (Retz.) Pal.-Beauv., Ess. Agrost. 54: 168-69. 1812; Gamble, Fl. Madras 1778(1232). 1934; Bor, Grasses India 317. 1960. *Panicum burmannii* Retz., Obs. Bot. 3: 16. 1783.

Slender annuals; awns longer than glumes, pale.

Pantropics. Common, in shade, on moist, sandy, loose soil. August-October. *HFP* 1138.

Oplismenus compositus (L.) Pal.-Beauv., Ess. Agrost. 54: 168. 1812; Gamble, Fl. Madras 1778(1231). 1934; Bor, Grasses India 317. 1960. *Panicum compositum* L., Sp. Pl. 57. 1753.

Perennial grasses; awns longer than glumes, often reddish.

Pantropics. Common in shade and moist soil. August-October. *CJS* 15375, 15646.

OROPETIUM Trinius

Dwarf, densely tufted perennials with narrow, filiform leaves. Inflorescence a solitary, inarticulate, slender, often curved spike. Spikelets

1-4-flowered, sessile, not articulated with rachis, sunk in the alternate distichous cavities of the tetragonous rachis; rachilla bearded, not produced beyond the lemma(s). Glumes subequal when both present; G1 often reduced or absent; G2 linear-lanceolate, rigid, concealing mouth of cavity, recurved in fruit. Lemma hyaline, ovate-oblong, 1-3-nerved, with an equally long, 2-keeled palea. Lodicules 2; stamens 3; styles 2, free; stigmas plumose.

Oropetium thomaeum (L.) Trin., Fund. Agrost. 98, t. 3. 1820; Gamble, Fl. Madras 1830(1267). 1934; Bor, Grasses India 474. 1960.
Nardus thomaea L. f., Suppl. 105. 1781.

Tufts less than 8 cm; blade to 1.2 × 0.2 cm, filiform; sheath bearded near mouth; ligule an erect, lacerate membrane. Lemma bearded at base.

Tropical Africa to Burma. Common in hard-surfaced, dry soil at Bourdalboore (plains) or on surfaces oil on rocks as at Nagpuri. August-September. *HFP* 1102, 1952.

ORYZA Linnaeus

Annual or perennial, marsh or aquatic herbs. Blade flat, acuminate; ligule large, membranous. Inflorescence a large panicle, somewhat nodding. Spikelet 1-flowered, pedicelled; pedicel with cupuliform knob-like apex (considered rudimentary glumes by many authors); spikelet articulated above this. Glumes (considered L1, L2 by some) subequal, chartaceous, sometimes reduced and none. Lemma (L3) strongly laterally compressed, keeled, many-ribbed, scabrid on keel and ribs, acute, long-awned from tip or not; palea of similar texture, with narrow, hyaline wings. Lodicules 2; stamens 6; styles 2; stigmas plumose.

Oryza rufipogon Griff., Notul. 3: 5. 1851; Bor, Grasses India 605. 1960.

Perennial aquatic; culm below often spongy; spikelets long-awned from tip, deciduous.

East & S. India. Common, in tanks and pools in plains. August-December. *CJS* 15226, *HFP* 1218.

Note: Gamble, (*Fl. Madras* 1844(1276). 1934) following J. Hooker (1896) apparently considered this a mere variant of *Oryza sativa* L. See Sharma and Shastry (*Bull. Bot. Sur. India* 6: 211-218. 1964) for a full discussion on the taxonomy and nomenclature of this taxon.

Oryza sativa L. commonly known as paddy is pantropically cultivated in numerous forms.

PANICUM Linnaeus

Annual or perennial herbs; blade broad or narrow. Inflorescence a contracted or effuse panicle; spikelets lanceolate to oblong, elliptic, sub-

acute or muticous, 2-flowered, long or short-pedicelled, falling entire from pedicel. Glumes herbaceous, usually unequal, generally glabrous; G1 usually less than 1/2 as long as spikelet, 1-5-nerved or enervate; G2 as long as the spikelet, rarely shorter, 6-11-nerved; L1 like G2 in texture and appearance, its palea shorter, thinner, male or neuter. L2 chartaceous, hardening in fruit, glossy, smooth or rugose or tuberculate, involute at margin; its palea basally auricled, ovate, acute. Lodicules 2; stamens 3; styles 2, free; stigmas plumose.

1 Blade ovate, oblong-lanceolate, asymmetrical at base.....*P. brevifolium*
1 Blade linear-lanceolate, symmetrical at base.
2 Leaf-sheath glabrous.
3 Aquatic perennial; culm spongy at base, creeping; spikelets lanceolate, 3.8 mm long .....*P. paludosum*
3 Marsh or land plants, annuals; culms not spongy, tufted; spikelets oblong, acute, 3 mm long.....*P. psilopodium*
2 Leaf-sheath hairy, sometimes only near margin at tip.
4 Culm rhizomatous at base; blade glabrous.....*P. repens*
4 Culm not rhizomatous at base; blade hairy.....*P. tripheron*

Panicum brevifolium L., Sp. Pl. 59. 1753; Gamble, Fl. Madras 1783 (1235). 1934; Bor, Grasses India 324. 1960.

Weak perennials; blade ovate, oblong-lanceolate, acute-acuminate, amplexicaul, asymmetrical at base. Panicle effuse; spikelets sparsely hairy.

Paleotropics. Common, in moist, shaded areas (cardamom plantations, forest clearings) in upper Ghats. September-January. *CJS* 15752, *HFP* 1527.

Panicum paludosum Roxb., Fl. Ind. 1: 310. 1820; Gamble, Fl. Madras 1783(1235). 1934; Bor, Grasses India 329. 1960.

Aquatic floating perennial with spongy culms; blade linear-lanceolate. Panicle more or less contracted; spikelets lanceolate, glabrous.

Indomalaysia. Common, in the tanks in plains and upper Ghats. All seasons. *CJS* 17931, 16108.

Panicum psilopodium Trin., Gram. Panic. 217. 1826; Gamble, Fl. Madras 1782(1234). 1934; Bor, Grasses India 329. 1960.

Annuals with lanceolate, acuminate blades. Panicle somewhat spreading; glumes glabrous.

Indomalaysia. Common, sometimes found in seasonal marshes. July-September. *CJS* 14729, *HFP* 671.

Note: Bor lists *Panicum flexuosum* Retz. (*Obs. Bot.* 3: 9. 1783) as a synonym of *P. psilopodium* Trin. though it is clearly priorable. Dr. Clayton writes (personal communication), "no one has seen the type and it is not at all certain what it is. It should be treated as name of uncertain application."

Panicum repens L., Sp. Pl. ed. 2, 87. 1762; Gamble, Fl. Madras 1783(1235). 1934; Bor, Grases India 330. 1960.

Perennials. Culms shortly rhizomatous at base; blade linear. Spikelets 3.2 mm.

Pantropics. Common, in loose, sandy areas in plains and Ghats. July-September. *CJS* 8973, *HFP* 260.

Panicum tripheron Schultes, Mant. 2: 244. 1824; Gamble, Fl. Madras 1783(1235). 1934; Bor, Grasses India 331. 1960. *Panicum tenellum* Roxb., (Hort. Beng. 7. 1814, *nom.*) Fl. Ind. 1: 309. 1820, non Lam., 1791.

Tufted perennials; leaves mostly basal, lanceolate, acuminate, hairy; sheath hairy all around; spikelets widely gaping at anthesis.

Indomalaysia. Common, in plains and Ghats. July-September. *CJS* 14254, 15711.

PASPALIDIUM Stapf

Annual or perennial, with erect or creeping and ascending culms; blade narrow, lanceolate, acuminate or rounded at tip. Inflorescence of alternate, spiciform racemes on common rachis; spikelets subsessile, solitary, regularly 2-seriate, ovate-acute, scarcely compressed, convex on the back, 2-flowered, articulated on short pedicel, deciduous. Glumes membranous, unequal; G1 abaxial, sometimes very much reduced; G2 shorter or as long as spikelet, 5-7-nerved; L1 like G2, to 7-nerved; its palea slightly shorter, with involute margin, male or empty; L2 crustaceous, oblong to elliptic in outline, with firm, involute margins, acute; palea of similar texture, embraced by L2. Lodicules 2; stamens 3; styles 2, free; stigmas plumose.

1 Racemes shorter than the internode.....*P. flavidum*
1 Raceme longer than internode.....*P. geminatum*

Paspalidium flavidum (Retz.) A. Camus in Lecomte, Fl. Gen. Indo-Chine 7: 419. 1922; Gamble, Fl. Madras 1774(1229). 1934; Bor, Grasses India 333. 1960. *Panicum flavidum* Retz., Obs. Bot. 4: 15. 1786.

Annuals. Blade lanceolate, often rounded at apex.

S. Asia. Common in plains and upper Ghats, in moist areas. July-August. *CJS* 14013, *HFP* 261.

Paspalidium geminatum (Forskal) Stapf in Prain, Fl. Trop. Africa 9: 583. 1920; Gamble, Fl. Madras 1774(1229). 1934; Bor, Grasses India 330. 1960. *Panicum geminatum* Forskal, Fl. Aegypt.-Arab. 18. 1778.

Perennials. Culms often spongy; blade lanceolate, acuminate.

Paleotropics. Common, along margins of tanks and in seasonal marshes. December-July. *CJS* 15704, *HFP* 1833.

PASPALUM Linnaeus

Perennial herbs, occasionally annuals; culms creeping and ascending or tufted. Blade flat, narrow, lanceolate. Inflorescence of spiciform racemes. Spikelets solitary, sometimes paired, alternate or crowded, 2-flowered, 2-seriate, convex on one side, shortly pedicelled, articulated with the tip of pedicel, deciduous. G1 absent; G2 and the epaleate L1 similar, the size and shape of spikelet, the former sometimes shorter; L2 chartaceous or crustaceous, firmly involute along margin, its palea of similar texture, with inflexed, membranous margin. Lodicules 2; stamens 3; styles 2, free; stigmas plumose.

1 G2 white-ciliate along margin.....*P. conjugatum*
1 G2 not white-ciliate along margin.
2 Spikelets 1.75 mm or less long.....*P. compactum*
2 Spikelets more than 1.75 mm long.
3 Annuals; L2 5-nerved.....*P. scrobiculatum*
3 Perennial; L2 3-nerved, marginal nerves double.....*P. orbiculare*

Paspalum compactum Roth, Nov. Pl. Sp. 36. 1821; Gamble, Fl. Madras 1772(1228). 1934; Bor, Grasses India 336. 1960.

1 G2 entire.....var. *compactum*
1 G2 fimbriate along margin.....var. *fimbriatum*

var. **compactum**

Terrestrial annuals with ovate-acute, hairy blades.

Hills in India except Himalayas. Occasional, on moist sandy soil at Genkalbetta (upper Ghats). September. *HFP* 902.

var. **fimbriatum** Bor, Grasses India 336. 1960.

Perennial aquatic, floating herbs, with ovate-acute, hairy blades.

South W. India. Locally common at lower Bisle Ghat. August-November. *CJS* 15643, *HFP* 989.

Paspalum conjugatum Bergius, Acta Helv. Phys.-Math. 7: 129, t. 8. 1772; Gamble, Fl. Madras 1772(1228). 1934; Bor, Grasses India 336. 1960.

Perennial stoloniferous herbs with lanceolate, acuminate blades. Spikelet white-ciliate along margin.

Pantropics. Common, in shade, on loose sandy moist soil in the Ghats. August-November. *HFP* 1157, 1519.

Paspalum orbiculare G. Forster, Fl. Insul. Aust. Prodr. 7. 1786; Gamble, Fl. Madras 1772(1227). 1934; Bor, Grasses India 340. 1960.

Perennial. G2 3-nerved, the lateral nerves double.

Indomalaysia. Common, in plains and Ghats. July-December. *HFP* 349, 687.

Paspalum scrobiculatum L., Mant. 29. 1767; Gamble, Fl. Madras 1772(1227). 1934; Bor, Grasses India 340. 1960.

A cultivated annual grass, similar to preceding species.

India. Common in plains and upper Ghats. *CJS* 13422, 14685.

PENNISETUM L. Richard

Annuals or perennials with creeping and ascending or erect culms; blade narrow, flat or convolute. Inflorescence of spike-like dense panicle; branches short, simple with solitary spikelets or spikelets in clusters of 2-5; spikelets terete, ovate-lanceolate, 1-2-flowered, deciduous with the subtending involucre of free, scabrid or plumose, unbranched (rarely branched) bristles. Glumes hyaline, small; G1 often suppressed; G2 larger than G1, rarely more than half as long as spikelet; lemmas thin; L1 as long as or shorter than spikelet, with incurving margin, its palea if present, with a male floret; L2 like L1, as long as the spikelet; its palea 2-nerved (keeled). Lodicules none; stamens 3; anthers often penicillate tipped; styles 2, free, more or less connate; stigmas plumose.

Pennisetum hohenackeri Hochst. ex Steudel, Syn. Pl. Glum. 1: 103. 1854; Gamble, Fl. Madras 1772(1241). 1934; Bor, Grasses India 344. 1960. *Gymnothrix cenchroides* Roemer & Schultes, Syst. Veg. 2: 499. 1817.

Densely tufted perennial with convolute, narrow blade. Spikelets solitary, 2-flowered. G1 reduced and scaly; G2 1-3-nerved; L1 8-nerved; L2 7-nerved with a 2-keeled palea.

Western India. Common, in open country and bunds of paddy fields in plains and upper Ghats. August-October. *CJS* 14316, 15008.

Note: Roemer & Schultes' epithet cannot be transferred to *Pennisetum* without creating an illegitimate later homonym of *Pennisetum cenchroides* Persoon (1805).

* * *

Pennisetum typhoides (N. Burman) C. Hubbard is cultivated in the District for its grain called Millet (English), Bajra (Hindi), Sajjai (Kannada).

PEROTIS Aiton

Perennials; culms tufted, usually geniculate and ascending. Leaves imbricate at base; blade ovate, acute, amplexicaul at base; margin

cartilaginous and spinulose. Ligule none. Inflorescence a terminal, spike-like raceme; spikelet shortly pedicelled, 1-flowered; rachilla disarticulating below glumes. Glumes subequal, 1-nerved, generally hairy, ending in a long, capillary awn. Lemma about half as long as the glumes, hyaline, membranous; palea smaller, 2-nerved, hyaline. Lodicules 2; stamens 3; styles 2; stigmas plumose.

Perotis indica (L.) Kuntze, Rev. Gen. Pl. 2: 787. 1891; Gamble, Fl. Madras 1814(1256). 1934; Bor, Grasses India 611. 1960. *Anthoxanthum indicum* L., Sp. Pl. 28. 1753.

Blade to 2×0.4 cm with glabrous sheath. Raceme slender, often purplish.

Indomalaysia. Common, in scrub and open country across plains. August-October. *CJS* 14252, *HFP* 1091.

PHRAGMITES Trinius

Perennial, aquatic or semiaquatic herbs. Blade flat or narrow, deciduous. Inflorescence a compound panicle. Spikelets 3-10-flowered; rachilla disarticulating between lemmas, white-ciliate; lowest floret abortive; succeeding one bisexual, uppermost sometimes reduced. Glumes unequal, membranous, ovate-lanceolate, acute, 1-5-nerved, persistent; lemmas dissimilar, lowest (L1) empty, abortive or male, persistent, longer than the subtending glumes, 3-nerved, enclosing a membranous, 2-keeled palea, half its length; the following lemmas thinner, linear, acuminate, rounded on the back, 3-nerved, enclosing a bisexual, 2-keeled palea, half its length. Lodicules 2; stamens 3 or 2 in the lowest floret; styles 2, free; stigmas 2, plumose.

Phragmites karka (Retz.) Trin. ex Steudel, Nom. Bot. ed. 2, 2: 324. 1841; Gamble, Fl. Madras 1807(1251). 1934; Bor, Grasses India 416. 1960. *Arundo karka* Retz., Obs. Bot. 4: 21. 1786.

Culm rhizomatous, creeping; flowering ones erect; blade 50×1.5 cm, glabrous; lemma 9-10 mm.

Indomalaysia. Occasional; in water courses at Belur, in plains. January. *CJS* 12341.

POGONATHERUM Palisot de Beauvois

Densely tufted perennials. Culms erect, leafy, branching near apex; blade lanceolate. Inflorescence a solitary spike-like raceme; rachis slender, hairy. Spikelet 2-nate; sessile (1-2-flowered) and pedicelled (1-flowered), bearded at callus. Glumes membranous, dissimilar; G1

rounded on the back, unawned; G2 compressed, keeled, with a long awn from the notched tip. L1 and palea present or wanting or L1 alone present, convex, acute, empty or male (stamens 3) rarely bisexual. L2 convex, keeled, with a long awn from acutely 2-fid tip; its palea hyaline. Lodicules none; stamens 1-2; styles 2, free; stigmas plumose.

Pogonatherum paniceum (Lam.) Hackel, Allg. Bot. Z. Syst. 12: 178. 1906; Gamble, Fl. Madras 1714(1188). 1934; Bor, Grasses India 202. 1960. *Saccharum paniceum* Lam., Encycl. 1: 595. 1785.

A much branched herb resembling a miniature bamboo.

Tropical India, Burma, Sri Lanka. Common, on road cuts in Ghats. January-April. *CJS* 13386, *HFP* 2742.

PSEUDECHINOLAENA Stapf

Perennial; culm creeping at base; blade thin, ovate-acute, asymmetrical and amplexicaul at base. Inflorescence a panicle of spike-like racemes; racemes few. Spikelets usually in pairs, somewhat compressed, obliquely ovate, acute, 2-flowered, pedicellate or subsessile, falling entire. Glumes dissimilar; G1 smaller, oblong, acute, cuspidate, 3-nerved, with few suppressed bristles on the back or glabrous; G2 chartaceous, as long as spikelet, gibbous, ovate, acute, 5-nerved, with large number of hooked bristly spinules on the back between nerves, sometimes few or none in the subsessile spikelet; rarely the spikelet glabrous; L1 chartaceous, oblong, acute, 3-nerved, broadly scarious at margin; its palea of similar texture and shape, empty or male; L2 coriaceous, convex, acute, paleate, bisexual. Lodicules 2; stamens 3; styles 2, free; stigmas plumose.

Pseudechinolaena polystachya (H., B. & K.) Stapf in Prain, Fl. Trop. Africa 9: 495. 1919; Gamble, Fl. Madras 1766(1224). 1934; Bor, Grasses India 352. 1960. *Echinolaena polystachya* H., B. & K., Nov. Gen. Sp. 1: 119. 1816.

Blade sparsely hairy; sheath ciliate along margin; ligule membranous.

Pantropics. Common, in shade in hills and forest clearings in upper Ghats. September-November. *CJS* 15465, *HFP* 570.

PSEUDOPOGONATHERUM A. Camus

Tufted perennials; blade narrow, lanceolate. Inflorescence of clustered, spiciform racemes; spikelets paired, both pedicelled or one subsessile, deciduous from tip of pedicel or falling with it, 2-flowered; pedicel white-hairy. Glumes subequal, membranous or chartaceous; G1 oblong, convex on back or flat with incurving margins; G2 like G1, except often aristate

from bifid tip; lemmas hyaline; L1 often wanting, male or empty; L2 narrow, stipiform, bifid with an awn from sinus, paleate, bisexual. Lodicules 2, stamens 3; styles 2, free; stigmas plumose.

Pseudopogonatherum contortum (Brongniart) A. Camus in Lecomte, Fl. Gen. Indo-Chine 7: 255. 1922; Gamble, Fl. Madras 1716(1189). 1934; Bor, Grasses India 204. 1960. *Pogonatherum contortum* Brongniart in Duperrey, Voy. Coq. Bot. 90. 1831.

Blade lanceolate, acuminate, hairy on the inside; ligule a tuft of hairs. Difficult to separate from *Eulalia* and distinguished by the convex G1 and the aristate G2.

Indomalaysia. Locally common at Genkalbetta (upper Ghats) on grassy slopes. November-January. *CJS* 15929.

PSEUDORAPHIS Griffith

Floating (marsh) perennials; blade narrow, lanceolate, acuminate, Inflorescence a panicle of spike-like racemes; spikelets shortly pedicelled, solitary, terete, slightly compressed, spaced, 2-flowered, deciduous, supported by a caducous bristle. Glumes unequal; G1 membranous, truncate, less than 1/3 the length of spikelet, enervate; G2 coriaceous, as long as the spikelet, acuminate, many-nerved, scabrid along margin; L1 like G2, shorter, acuminate, scabrid along margin; its palea hyaline, male; L2 shorter than L1, membranous, slightly hardening in fruit, paleate, bisexual or female. Lodicules 2; stamens 3, rudimentary in female; styles 2, united at base.

Pseudoraphis spinescens (R. Br.) Vickery, Proc. Roy. Soc. Queensland 9: 495. 1919; Bor, Grasses India 353. 1960. *Panicum asperum* Koenig, Naturforscher (Halle) 23: 209. 1788, non Lam., 1778. *Panicum spinescens* R. Br., Prodr. 193. 1810. *Pseudoraphis aspera* (Koenig) Pilger, Notizbl. Bot. Gaert. Berlin-Dahlem 10: 210. 1928.

Blade scabrid; sheath with appressed tubercles; ligule membranous.

Indomalaysia. Common, in large tanks and pools, in plains and upper Ghats. All seasons. *CJS* 13931, *HFP* 1835.

SACCHARUM Linnaeus

Tall, stout perennial with erect culms; occasionally culms creeping at base; blade linear-lanceolate. Inflorescence a contracted or spreading panicle composed of spike-like racemes; branches on all sides of central axis; all axes except central one breaking up at maturity; spikelets in pairs, one pedicelled (falling from pedicel) one sessile (falling with adjacent

internode and pedicel), 2-flowered, covered by hairs from the base. Glumes as long as the spikelet, subequal, chartaceous below, membranous upward; L1 slightly shorter, hyaline, epaleate, empty; L2 sometimes wanting, shorter than glumes, hyaline, muticous, rarely awned, paleate, bisexual. Lodicules 2; stamens 3; styles 2, free or shortly connate.

Saccharum spontaneum L., Mant. Alt. 183. 1771; Gamble, Fl. Madras 1709(1185). 1934; Bor, Grasses India 214. 1960.

Culms erect; blade and sheath glabrous; ligule a fringe of hairs. Panicle contracted; glumes reddish brown below the middle, ciliate along margin.

Pantropics. Common, on bunds of paddy fields and along banks of the rivers, in plains and upper Ghats. October-February. *CJS* 15331, *HFP* 1203.

Note: Sugarcane, *Saccharum officinarum* L., and its hybrids are extensively cultivated.

SACCIOLEPIS Nash

Annual or perennial, marsh or aquatic herbs; blade linear-lanceolate. Inflorescence a contracted, spike-like, cylindrical panicle. Spikelets solitary, 2-flowered, terete or slightly compressed, muticous, articulated with pedicel. G1 smaller than the spikelet, acute; G2 and L1 as long as spikelet, or G2 slightly shorter; G2 gibbous at base, stiffened by 7-13 nerves, hyaline along margin; L1 similar to the G2, but not gibbous; its palea 2-keeled, male, barren or absent. L2 crustaceous, faintly nerved, involute at margin, slightly hardening at maturity; its palea of same texture, as long or slightly shorter, bisexual. Lodicules 2; stamens 3; styles 2, free; stigmas plumose.

1 Culm hardly spongy below; spikelets 3.5 mm or less, often hairy.....*S. indica*
1 Culm invariably spongy below: spikelets 4 mm and above, glabrous.....*S. interrupta*

Sacciolepis indica (L.) A. Chase, Proc. Biol. Soc. Wash. 21: 8. 1908; Gamble, Fl. Madras 1787(1238). 1934; Bor, Grasses India 357. 1960. *Aira indica* L., Sp. Pl. Errata 1753.

A tufted grass. Spikelets 3-3.5 mm; G2 often hairy.

Indomalaysia. Common, often in marshes and on bunds of paddy fields in upper Ghats. August-October. *CJS* 15747, 15748, *HFP* 837.

Sacciolepis interrupta (Willd.) Stapf in Prain, Fl. Trop. Africa 9: 757. 1920; Gamble, Fl. Madras 1787(1238). 1934; Bor, Grasses India 358. 1960. *Panicum interruptum* Willd., Sp. Pl. 1: 341. 1798.

Aquatic or a semi-aquatic grass, with base of culm spongy; spikelets 4-4.2 mm.

Indomalaysia. Common in tanks and ponds across plains and upper Ghats. All seasons. *CJS* 12329, 16100.

SEHIMA Forskal

Tufted annuals or perennials; blade linear. Inflorescence of solitary spike-like racemes; rachis jointed and fragile; spikelets compressed, paired, sessile and pedicelled, 2-flowered. *Sessile spikelet* oblong; G1 the size of spikelet, chartaceous, with a translucent, longitudinal depression along center, strongly nerved (keeled) on either side of this, bicuspidate; keels near tip asymmetrically winged; G2 boat-shaped, keeled, narrowly winged on keel near tip; L1 shorter, hyaline, paleate, male (stamens 3) or empty; L2 hyaline, stipiform, bifid with awn from sinus; its palea narrowly oblong, 2-nerved, bisexual. Lodicules 2; stamens 3; styles 2, free; stigmas plumose. *Pedicelled spikelet* lanceolate; pedicel-like rachis joint; G1 convex with strong midnerve, with involute margin, 2-tipped, winged; G2 convex, acute, 3-nerved; L1 and palea membranous, 2-nerved, male. L2 and palea similar to L1 and its palea, male.

Sehima nervosum (Willd.) Stapf in Prain, Fl. Trop. Africa 9: 36. 1917; Gamble, Fl. Madras 1724(1195). 1934; Bor, Grasses India 218. 1960. *Andropogon nervosus* Rottler ex Willd., Verh. Ges. Naturf. Freunde Berlin 4: 218. 1806.

Perennial with a rhizomatous base. Joints of rachis and pedicel ciliate on both edges.

E. Africa, Indomalaysia. Occasional, in dry, sandy-rocky terrain at outskirts of Arsikere town (eastern plains). October-December. *CJS* 11321, *HFP* 1118.

SETARIA Palisot de Beauvois

Annual or perennial tufted herbs; blade linear-lanceolate. Inflorescence an open or contracted, cylindric panicle; spikelets elliptic-oblong acute, convex on one side, 2-flowered, articulate with tip of short pedicel, subtended by 1-many persistent bristles (modified branchlets). Glumes herbaceous; G1 short, 1-5-nerved; G2 larger, 5-9-nerved; L1 as long as the spikelet, herbaceous, acute, paleate, male or barren; L2 crustaceous, 5-nerved, hardening at maturity, convex on the back, transversely rugose-tuberculate, involute at margin; its palea of similar size and texture, bisexual. Lodicules 2; stamens 3, styles 2, free; stigmas plumose.

1 Panicle open, lobed.....*S. intermedia*
1 Panicle contracted, cylindric.....*S. pallide-fusca*

Setaria intermedia Roemer et Schultes, Syst. Veg. 2: 489. 1817; Gamble, Fl. Madras 1789(1239). 1934. *Panicum tomentosum* Roxb., Fl. Ind. 1: 303. 1820. *Panicum intermedium* (Roemer & Schultes)

Roth, Nov. Pl. Sp. 47. 1821, non Vahl ex Hornem. 1813. *Setaria tomentosa* (Roxb.) Kunth, Rev. Gram. 1: 47. 1829; Bor, Grasses India 365. 1960.

Involucral bristles 3-4.

Indomalaysia. Common along roadside ditches, usually in shade, in plains and Ghats. July-November. *CJS* 10234, 15006.

Setaria pallide-fusca (Schumacher) Stapf & C. Hubbard, Bull. Misc. Inform. 259. 1930; Gamble, Fl. Madras 1789(1239). 1934; Bor, Grasses India 363. 1960. *Panicum pallide-fuscum* Schumacher, Beskr. Guin. Pl. 58. 1827.

Involucral bristles usually 8.

Paleotropics. Common, in plains and Ghats. July-November. *CJS* 14307, 14489.

SPODIOPOGON Trinius

Annual or perennial herbs with creeping and ascending culms; blade long-petioled. Inflorescence a panicle of racemes; rachis jointed; spikelets laterally compressed, 2-3-nate, 1 sessile, 1-2-pedicelled, similar. Glumes subequal, membranous, to 9-nerved; L1 hyaline, unawned, paleate or not, male or empty; L2 hyaline, bifid, with a long awn from the sinus; its palea shorter, hyaline; lodicules 2; stamens 3; styles 2, free; stigmas plumose.

Spodiopogon rhizophorus (Steudel) Pilger in Engl. & Prantl, Pflanzenfam. 14e: 119. 1940; Bor, Grasses India 246. 1960. *Andropogon rhizophorus* Steudel, Syn. Pl. Glum. 1: 381. 1854. *Spodiopogon albidus* Bentham, J. Linn. Soc., Bot. 19: 66. 1881; Gamble, Fl. Madras 1710(1186). 1934.

Blade broad, flaccid, long-petioled; panicle narrow; rachis silky villous.

South W. India. Occasional, on sandy roadcuts at Kempuhole, in lower Shiradi Ghat. September. *CJS* 15395.

SPOROBOLUS R. Brown

Annual or perennial herbs with tufted culms; blade flat or convolute. Inflorescence an open, contracted or spike-like panicle; spikelets terete, 1-flowered, unawned, bisexual, on pedicels of unequal length. Glumes membranous, shorter or as long as spikelet, unequal or subequal, often truncate; G1 enervate; G2 1-nerved. Lemma very much like G2, 1-3-nerved; its palea hyaline, 2-nerved. Lodicules 2; stamens 2-3; styles 2, free; stigmas 2, plumose.

1 Branches of panicle, at least the lower ones whorled.....*S. coromandelianus*
1 Branches of panicle not whorled.
2 G2 as long as lemma.....*S. piliferus*
2 G2 shorter than lemma.
3 Stamens 2.....*S. diander*
3 Stamens 3.....*S. fertilis*

Sporobolus coromandelianus (Retz.) Kunth, Rev. Gram. 1: 68. 1829; Gamble, Fl. Madras 1817(1258). 1934; Bor, Grasses India 627. 1960. *Agrostis coromandeliana* Retz., Obs. Bot. 4: 19. 1786.

Annual. Blade ovate-lanceolate. Panicle effuse; lower branches distinctly whorled; G2 as long as lemma, 1-nerved; lemma 1-3 nerved. Stamens 3. Grain obovate, trigonous in outline.

South Africa, Afghanistan, Burma, India, Sri Lanka. Occasional, on hard-surfaced soil at Nagpuri (eastern plains). September. *HFP* 622.

Sporobolus diander (Retz.) Pal.-Beauv., Ess. Agrost. 26: 147, 178. 1812; Gamble, Fl. Madras 1817(1258). 1934; Bor, Grasses India 629. 1960. *Agrostis diandra* Retz., Obs. Bot. 5: 19. 1789.

Tufted perennials; blade convolute. Panicle contracted, gradually becoming effuse at maturity. Lemma longer than glumes. Stamens 2. Grain truncate above.

Indomalaysia. Common, in open country and along roads in plains and upper Ghats. July-September. *HFP* 618, 1828.

Sporobolus fertilis (Steudel) W. D. Clayton, Kew Bull. 19: 291. 1965. *Agrostis fertilis* Steudel, Syn. Pl. Glum. 1: 170. 1854. *Sporobolus indicus* auct. non (L.) R. Br.: Gamble, Fl. Madras 1817(1258). 1934.

Perennials. Blade with slightly infolding margin. Panicle contracted; G2 shorter than lemma; lemma 1-3-nerved; stamens 3. Grain truncate above.

Indomalaysia. Locally common near Saklespur (upper Ghats), on bunds of paddy fields. July-August. *CJS* 14308.

Sporobolus piliferus (Trin.) Kunth, Enum. Pl. 1: 211. 1833; Gamble, Fl. Madras 1817(1258). 1934; Bor, Grasses India 632. 1960. *Vilfa pilifera* Trin., Diss. Bot. 157. 1824.

Annuals. Panicle contracted, spiciform; G2 nearly as long as lemma. Stamens 2. Grain elliptic.

East Africa, India. Common, on hills in upper Ghats. July-August. *CJS* 15259, *HFP* 994.

TEINOSTACHYUM Munro

Note: Prof. R. E. Holttum (*Phytomorphology* 6: 73-89. 1956) feels that *Teinostachyum* along with *Pseudostachyum* and *Cephalostachyum,* should be united with *Schizostachyum.*

Small trees. Culms slender, drooping above; culm-sheath thin; imperfect blade recurved. Leaves broad. Inflorescence a panicle of spikes on leafy branches; spikelets in bracteate verticels, narrow, many-flowered; imperfect florets above and below perfect ones. Empty glumes 1-2, ovate, mucronate; lemmas like glumes, with longer mucros; palea convolute, 2-keeled, ciliate on keels. Lodicules 3; stamens 6 with free filaments; anthers exserted. Ovary depressed-globose, prolonged into a beak, enclosing style; style cleft into 3 short to long, plumose stigmas. Fruit acuminate, beaked, enclosed in a crustaceous pericarp.

Teinostachyum beddomei C. Fischer in Gamble, Fl. Madras 1860 (1287). 1934. *Teinostachyum wightii* sensu Beddome, Fl. Sylv. t. 323. 1874, not as to basionym *Bambusa wightii* Munro; Gamble, Ann. Roy. Bot. Gard. (Calcutta) 7: 99, t. 87. 1896.

Small trees; culm-sheath membranous, to 30 cm long, brownish-yellow, black bristly on back; imperfect blade recurved. Leaves to 35 × 7 cm, broad, acuminate, glaucous beneath. Panicle drooping.

South W. India. Common usually in shade of large trees, in the upper-middle Ghats. It was found in flower over large areas in 1969. *CJS* 13873, 17850.

THEMEDA Forskal

Annuals or perennials; leaves narrow. Inflorescence racemose or spikelets in paniculate or glomerate fascicles, interrupted by spathes; rachis tardily disarticulating between homogenous pairs of spikelets. The lowest set of spikelets persistent, superposed or whorled, nearly sessile, forming an involucre, barren or male; the following spikelets 2-3-nate; one sessile. *Sessile spikelet* terete with a pungent, bearded callus; glumes equal, coriaceous, involute; G1 grooved along center; G2 grooved on either side of mid-nerve; L1 epaleate, empty; L2 stipiform, long-awned from tip, paleate, bisexual. *Pedicelled spikelet* similar to involucral; G1 laterally 2-keeled; lemmas epaleate, empty.

1 Involucral spikelets superposed..... *T. tremula*
1 Involucral spikelets whorled.
2 Involucral spikelets over 6 mm long..... *T. triandra*
2 Involucral spikelets less than 6 mm long..... *T. quadrivalvis*

Themeda quadrivalvis (L.) Kuntze, Rev. Gen. Pl. 2: 794. 1891; Gamble, Fl. Madras 1746(1210). 1934; Bor, Grasses India 252. 1960. *Andropogon quadrivalvis* L. in Murray, Syst. Veg. ed. 13, 758. 1774.

Annual. Spathe not bristly. Involucral spikelet 5 mm.

India. Common in dry areas, across plains. September-December. *HFP* 1221, 1224.

Themeda tremula (Steudel) Hackel in A. & C. DC., Monogr. Phan. 6: 667. 1889; Gamble, Fl. Madras 1746(1210). 1934; Bor, Grasses India 254. 1960. *Anthistiria tremula* Nees ex Steudel, Syn. Pl. Glum. 1: 401. 1854.

Perennials. Spathe tubercle bristly. Fascicle with 2 sessile spikelets.

S. India, Sri Lanka. Common on grassy slopes in upper Ghats. August-December. *CJS* 15394, *HFP* 1172.

Themeda triandra Forskal, Fl. Aegyp.-Arab. 178. 1775; Gamble, Fl. Madras 1764(1209). 1934; Bor, Grasses India 254. 1960.

Perennials. Spathe with few bristles. Fascicle with one sessile spikelet.

Pantropics. Common across the plains. August-December. *CJS* 9948, 11376.

TRAGUS Haller

Perennial herbs; culm creeping below. Leaves imbricating, ovate, acute to a pungent point, amplexicaul at base, spinulose along margin. Inflorescence a solitary, spiciform raceme; spikelet in clusters of two, facing each other, 1-flowered, bisexual; rachilla articulating on the short peduncle. G1 absent; G2 convex on the back, acuminate, 5-ribbed, with hooked spinules on ribs; lemma membranous, ovate, acute, finely hairy on the back, 1-nerved, its palea hyaline, bisexual. Lodicules 2; stamens 3; styles 2, free; stigmas plumose.

Tragus roxburghii Panigrahi, Kew Bull. 29: 495. 1974. *Lappago biflora* sensu Roxb., Fl. Ind. 1: 284. 1820 quoad descrip. excl. typo. *Tragus biflorus* sensu Schultes, Mant. 2: 205. 1824; Gamble, Fl. Madras 1813(1255). 1934; Bor, Grasses India 682. 1960.

East Africa, India, S. E. Asia. Common, on hard-surfaced soil in the plains. July-September. *CJS* 13937.

Note: Panigrahi has proposed a new name for the common Indian grass known in local Floras as *T. biflorus*. He argues that *T. biflorus* cannot designate the Indian plant since Roxburgh cited the earlier *Phalaris muricata* Forsk. as a direct nomenclatural synonym of *Lappago biflora*.

TRIPOGON Roemer et Schultes

Annual or perennial, tufted herbs. Leaves convolute. Inflorescence a solitary spike or raceme; spikelets secund or not, sessile, not articulate

with rachis, 2-many-flowered; rachilla jointed at base, produced between lemmas but not beyond uppermost. Glumes membranous, unequal; G1 much the smaller; G2 longer, sometimes notched at tip, mucronate or aristate. Lemma ovate, 3-5-nerved, bilobed and awned from sinus or up to 4-lobed with the nerves terminating in awns; palea hyaline, 2-keeled, bisexual. Lodicules 2; stamens 3; styles 2, free; stigmas plumose.

1 Lemma 4-lobed..... *T. bromoides*
1 Lemma bilobed..... *T. capillatus*

Tripogon bromoides Roemer & Schultes, Syst. Veg. 2: 600. 1817; Gamble, Fl. Madras 1834(1269). 1934; Bor, Grasses India 521. 1960.

Perennial tufted herb with convolute leaves. Spikelets 1 cm long; G2 2-lobed at tip; lobes acute, with a short arista from the center.

S. India, Sri Lanka. Locally common in hills around Nagpuri on rock surfaces. August-September. *CJS* 13551, *HFP* 1078, 1727.

Tripogon capillatus Jaubert & Spach, Illust. Fl. Orient. 4: 47, t. 332. 1851; Gamble, Fl. Madras 1833(1269). 1934; Bor, Grasses India 521. 1960.

Tufted perennials. Blade convolute. G2 shortly aristate. Lemma bilobed with a long central awn.

Parasnath Mt. in Bihar, South W. India. Common on soil collected in tree clefts in upper Ghats. July-October. *CJS* 17964, *HFP* 822.

UROCHLOA Palisot de Beauvois

Annual or perennial herbs; culm tufted, erect. Leaves linear-lanceolate to ovate-lanceolate. Inflorescence a panicle of spiciform racemes, sessile or subsessile on a common axis; spikelets in pairs or solitary, broadly ovate, acute, 2-flowered, falling entire from pedicel; pedicel hairy at tip. Glumes membranous, 3-8-nerved, glabrous or hairy, acute, unequal; G1 smaller, turned away from axis. L1 similar to G2, 5-nerved, male or barren; L2 crustaceous, hardening in fruit, convex on back, rugose, usually with a barbellate mucro or cusp, with firm involute margin; its palea bisexual. Lodicules 2; stamens 3; styles 2, free; stigmas plumose.

Urochloa panicoides Pal.-Beauv., Ess. Agrost. 53, t. 11, f. 1. 1812; Gamble, Fl. Madras 1775(1230). 1934; Bor, Grasses India 372. 1960.

1 Spikelets glabrous..... var. *panicoides*
1 Spikelets pubescent..... var. *pubescens*

var. **panicoides**

Blade subcordate, clasping stem, hairy or not. L2 with a cusp.

India, Africa. Common in plains and upper Ghats. July-September. *CJS* 17933.

var. **pubescens** (Kunth) Bor, Grasses India 372. 1960. *Urochloa pubescens* Kunth, Rev. Gram. 1: 31. 1829.

Spikelets pubescent.

India, Africa. Common in plains and Ghats. August-September. *HFP* 273.

VETIVERIA Lemaire

Perennials; culm rhizomatous at base; flowering culms ascending. Blade linear-lanceolate. Inflorescence a panicle of spiciform racemes, digitate whorled; rachis hairy; spikelets in pairs, sessile and pedicelled, 2-flowered. *Sessile spikelet* slightly laterally compressed; glumes dissimilar, chartaceous or coriaceous; G1 as long as spikelet, convex with incurved margins, acute, beset with bristles, 7-nerved; G2 as long as G1, boat-shaped, keeled on back, with membranous margins, shortly 2-fid, mucronate or aristate from sinus; L1 as long as glumes or shorter, membranous, 2-nerved, epaleate, empty; L2 membranous, shortly 2-fid, muticous, mucronate or awned from sinus; its palea short, enervate with a bisexual floret. Lodicules 2; stamens 3; styles 2, free; stigmas plumose. Pedicelled spikelet more or less similar to sessile but male.

Vetiveria lawsonii (J. Hooker) Blatter et McCann, J. Bombay Nat. Hist. Soc. 32: 409. 1928; Gamble, Fl. Madras 1733(1201). 1934; Bor, Grasses India 258. 1960. *Andropogon lawsonii* J. Hooker, Fl. Brit. India 7: 187. 1896.

G1 thickly coriaceous, ensiform with a row of marginal tubercles which become spinulose near tip; G2 awned from sinus.

Western Karnataka. Common, in open country, in plains and upper Ghats. August-October. *CJS* 15011, *HFP* 264.

140. TYPHACEAE

K. N. Gandhi

TYPHA Linnaeus

Aquatic or paludose, perennial, erect, monoecious herbs; rhizome submerged, creeping, scaly. Leaves radical, elongate; base sheathing; venation striate. Inflorescence an interrupted spike, the upper part staminate, the lower pistillate, each subtended by a caducous, foliaceous

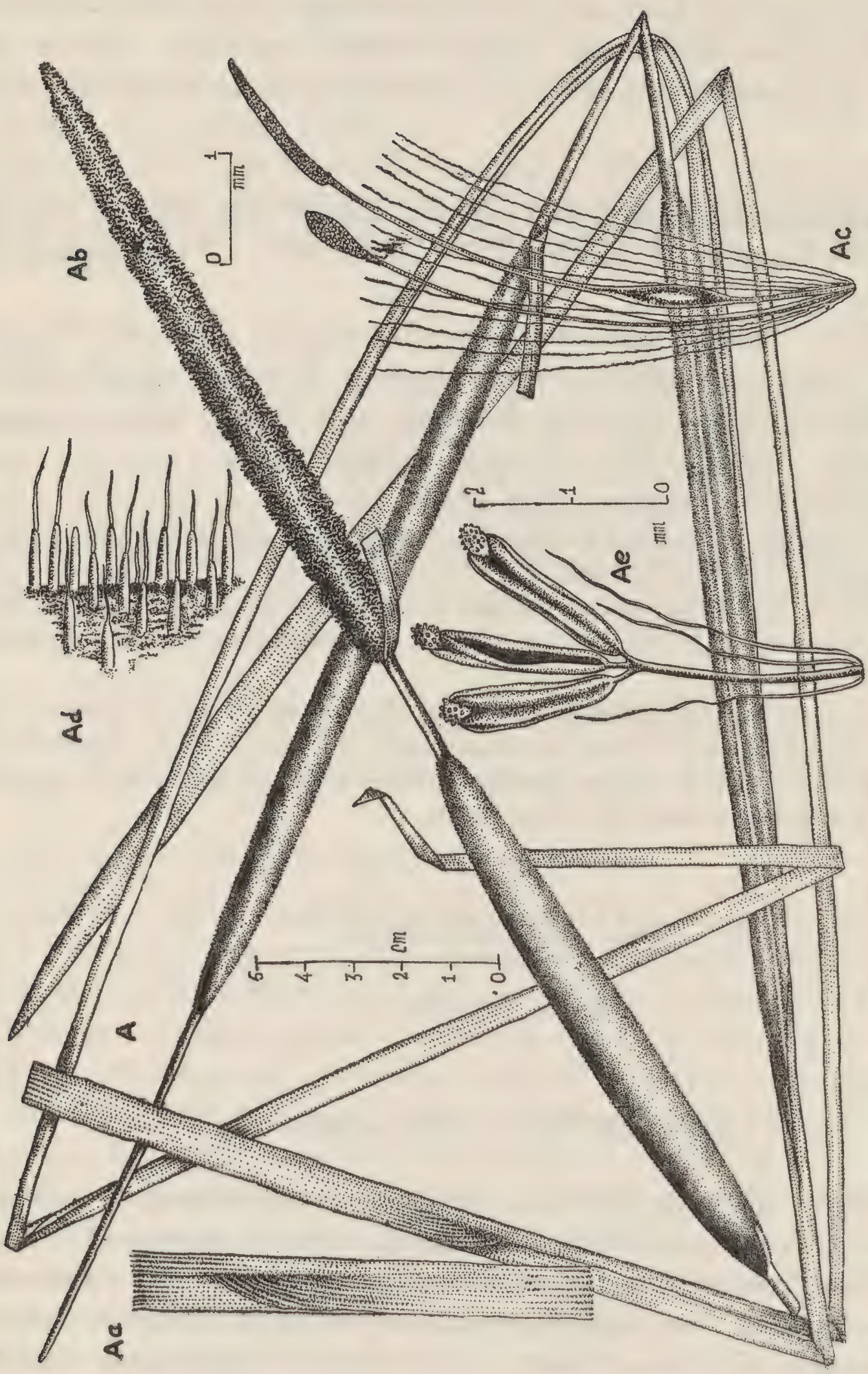


Fig. 112. TYPHACEAE. *A.* *Typha angustata*: male plant; *Aa*, leaf sheath with auricle; *Ab*, female and male inflorescences; *Ac*, female floret; *Ad*, pedicels of pistillate spike ; *Ae* male floret.

bract. Flowers unisexual. Staminate flowers deciduous, leaving naked spike; perianth of 3 flattened hairs; stamens usually 3; filaments connate; anthers free, linear, basifixed. Pistillate flowers intermixed with clavate pistillodes; bracteoles deciduous, long clavate; perianth of many capillary bristles; ovary superior, fusiform, borne on a long, gynophore, 1-locular; ovule 1, pendulous; style long; stigma lateral, spatulate. Fruit an achene with a persistent style and stipe, dehiscing by a lateral slit; seed striate.

Typha angustata Chaubard, Bory et al., Exped. Sci. Moree, Bot. 1: 338. 1833; Gamble, Fl. Madras 1571(1096). 1931. *Typha angustifolia* auct. non L.

Stem to 3 m. Leaves subterete above the sheath, flattened at apex, 1.5 m×0.6-1 cm; leaf sheath auricled, scarious along the margin, 50-60 cm long. The distance between the male and female spikes ranging from 5-15 cm. Sterile ovary obovoid. Stigma linear.

India. In marshes of plains. *CJS* 12181, 13556.

Note: The taxonomy of this genus is difficult with no constant morphological characters to distinguish species. Geze (*Et. Typha* 115. 1912) and Mason (*Fl. Marshes California* 39. 1957) reduce *Typha angustata* Chaub. & Bory to synonymy under *T. domingensis* Pers. Backer (*Fl. Malesiana* ser. 1, 4: 243. 1951) reduces *T. domingensis* Pers. to synonymy under *T. angustifolia* L., sensu lato.

The genus is being monographed by Mr. Kurt Krattinger (Univ. of Zurich) who feels that *T. angustata* Chaub. & Bory is distinct from the European *T. angustifolia* L. Until further data is available on the question, we are retaining the name *T. angustata* Chaub. & Bory which is current in Indian works.

141. MUSACEAE

K. N. Gandhi

ENSETE Bruce ex Horaninow

Massive herbs. Leaves alternate, petioled, large, oblong-lanceolate, acute, acuminate or retuse, glabrous; sheaths convolute, persisting to form the basally dilated pseudostem; venation striate. Inflorescence a terminal, peduncled spike with flowers grouped in clusters, each cluster subtended by a large usually deciduous bract; upper clusters male, lower female. Flowers irregular. Perianth with 3 outer tepals connate in a split tube, 2 inner tepals sometimes absent or connate with outer ones in 5-lobed syntepalum; the 3rd inner tepal free. Stamens usually 5. Ovary inferior, 3-locular; ovules many, axile; style filiform; stigma subglobose, 6-lobed. Fruit an elongated berry; seeds many, subangular.

Ensete superbum (Roxb.) Cheesman, Kew Bull. 3: 100. 1948; Sant., Fl. Khandala ed. 3, 277. 1967. *Musa superba* Roxb., Pl. Cor. t. 223. 1811; Wight, Ic. t. 2017-18. 1853; Gamble, Fl. Madras 1497(1046). 1928; Sastri, The Wealth of India 6: 450. 1962.

Pseudostem swollen at base, to 4 m. Leaves 2-3 m. Bracts maroon, 20×15 cm. Flowers 20-30 to a bract. Berry trigonous. Seeds brown.

South W. India. Locally common on steep rocky slopes of Ghats. All seasons. *CJS* 13302, 14229.

Note: In *Musa* (*sensu stricto*) the pseudostem is cylindric with offsets (stools) and has chromosome number of n=10 or 11. In *Ensete* the stem is swollen at base, without offsets and has a chromosome number of n=7. (Cheesman *l.c.*)

* * *

In S. India the starchy cooking *Musa* is called "banana" and the sweet, desert-type is called "plantain." The application of the binomials *Musa sapientum* L. for the desert *Musa* and *Musa paradisiaca* for the cooking *Musa* cannot be maintained. Both names refer to closely allied triploid hybrids between *M. acuminata* Colla and *M. balbisiana* Colla. The identification of a given clone depends on an analysis of the contribution made by each parent and ploidy.

142. ZINGIBERACEAE

T. P. Ramamoorthy

Note: Dr. B. L. Burtt has kindly reviewed the text.

Distichous herbs, usually with aromatic fleshy rhizomes or stout rootstock bearing fleshy roots that sometimes end in globose tubers. Leaf-blade elliptic-lanceolate, usually short-petioled; sheath striate or smooth, scarious or not along margin, sometimes ciliate or hairy, ligulate; venation striate. Inflorescence a bracteate raceme or spike, sometimes panicled, on terminal, leafy or basal, leafless shoots. Flowers bisexual, solitary, paired or fascicled, irregular, subtended by 1-2 bracts. Calyx tubular, 3-lobed. Petals 3, connate, the posterior lobe larger and hooded. Staminodes of 3 petaloid structures, the outer 2 reduced or not, inner a large, bifid or entire lip. Stamen 1; anther sometimes spurred or winged, connective sometimes crested at tip or prolonged. Ovary inferior, usually 3-locular with many axile ovules; style filiform, long, clasped by anthers; stigma simple. Fruit baccate or capsular, rarely winged; seeds many, often arillate, variously angled or not.

1 Inflorescence on separate leafless shoots, associated with leafy stem.
2 Inflorescence paniculate; anther connective neither crested nor prolonged. . **Elettaria**
2 Inflorescence spicate; anther connective crested or prolonged.

3 Anther connective prolonged into a beak, enclosing style (lip and petaloid staminodes joined in a 3-lobed organ).....**Zingiber**
3 Anther connective truncate, crested.
4 Anther not spurred; lateral staminodes reduced to small teeth.....**Amomum**
4 Anther base spurred; lateral staminodes petaloid.....**Curcuma**
1 Inflorescence on a leafy shoot or leaves developing after flowering.
5 Inflorescence racemose to paniculate (pedicels 1-2 cm).
6 Lip deeply bifid; ovary 1-locular; plant glabrous, less than 1 m tall; flowers yellow .....**Globba**
6 Lip cleft at apex; ovary 3-locular; plants pubescent, 2-3 m tall; flowers scarlet with yellow margins.....**Alpinia**
5 Inflorescence spicate (pedicels to 0.5 cm).
7 Plants over 1 m tall. Corolla tube long, exserted.....**Hedychium**
7 Plants less than 1 m. Corolla tube included in bracts or slightly exserted.
8 Inflorescence concealed among leaves; flowers secund, white.....**Boesenbergia**
8 Inflorescence leafless or exserted above leaves; flowers on all sides, yellow..**Curcuma**

ALPINIA Roxburgh. *nom. cons.*

Sheath and ligule finely ciliate. Inflorescence a terminal raceme with large, deciduous, bracts covering buds; peduncle and pedicels fulvous-tomentose. Flowers solitary. Calyx teeth ciliate. Corolla tube shorter than calyx. Lip orbicular, shortly bilobed at apex, clawed at base with two narrow, filiform appendages. Stamens with a flat filament. Fruit baccate, subglobose pubescent; seeds angular, covered with a thin, white aril.

Alpinia malaccensis (N. Burman) Roscoe, Trans. Linn. Soc. London 8. 345. 1807; Gamble, Fl. Madras 1493(1043). 1928. *Maranta malaccensis* N. Burman, Fl. Ind. 2. 1768. *Catimbium malaccensis* (N. Burman) Holttum, Gard. Bull. Straits Settlem. 13: 152. 1950.

Leaf to 42×9 cm. Corolla lobes to 2.8×1.4 cm. Lip red with yellow margins, to 5.5 cm. Fruit turning orange-red.

Indomalaysia. Common along ravines, in the upper Ghats. April-May. *CJS* 14215, *HFP* 2706.

Note: The status of *Catimbium* Juss. 1784 is uncertain. It may remain as a section of *Alpinia* Roxb. 1810 (*nom. cons.*). If so, it will be priorable to *Alpinia* but it can be expected that *Catimbium* will be placed as a *nom. rej.* under *Alpinia*. B. L. Burtt and R. M. Smith (*Notes Roy. Bot. Gard. Edinburgh* 31: 205. 1972) have given a historical review of the problem associated with the generic name *Catimbium* Juss.

AMOMUM Roxburgh *nom. cons.*

Leaf glaucous-pubescent below; ligule glabrous. Inflorescence basal, capitulate spike, many or 1-3-flowered with many, coriaceous, glabrous bracts. Flower solitary. Lip orbicular-elliptic; lateral staminodes

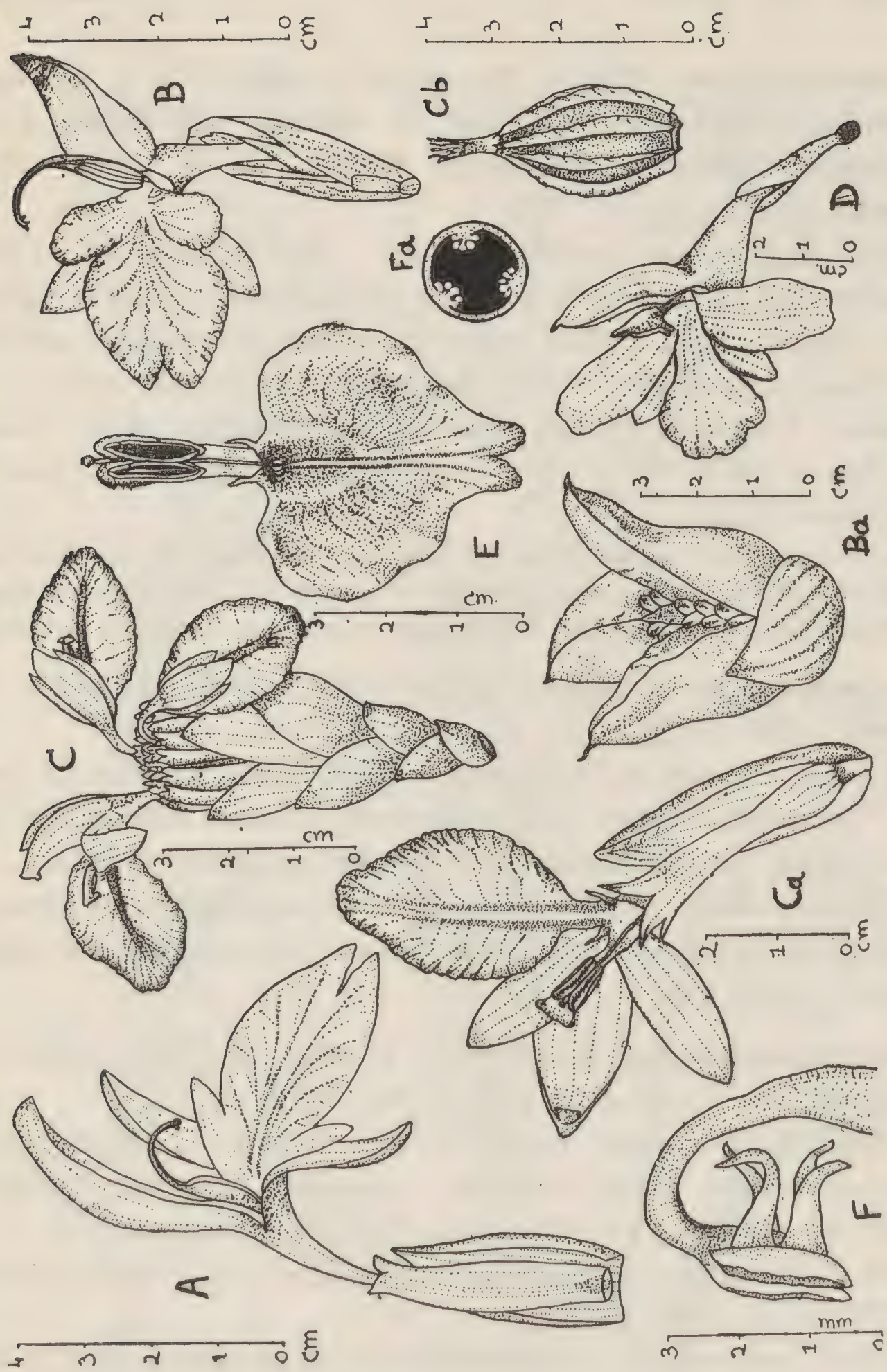


Fig. 113. ZINGIBERACEAE. *A. Zingiber cernuum*: flower; *B. Zingiber montanum*: flower. *Ba*, fruit. *C. Amomum microstephanum*: inflorescence; *Ca*, flower; *Cb*, winged capsule. *D. Curcuma neilgherrensis*: flower. *E. Alpinia malaccensis*: labellum with staminodes and stamen. *F. Globba bulbifera*: anther with wings; *Fa*, unilocular ovary.

reduced to subulate tooth-like appendages or none. Connective crested; anther subsessile. Fruit baccate.

1 Flowers 1-3 in the spike; fruits smooth.....*A. hypoleucum*
1 Flowers many in the spike; fruits winged or echinate.
2 Stem swollen at base; fruit densely echinate.....*A. cannicarpum*
2 Stem not swollen; fruit winged.....*A. microstephanum*

Amomum cannicarpum (Wight) Bentham ex Baker in J. Hooker, Fl. Brit. India 6: 240. 1892; Gamble, Fl. Madras 1487(1039). 1928 ('*cannaecarpum*'). *Elettaria cannicarpum* Wight, Ic. t. 2007. 1853 ('*cannaecarpum*').

Rhizome thick, fleshy; stem swollen at base. Leaf blade to 44×7 cm. Spikes with many bright pink bracts covering the peduncle which is buried for most of its length. Lip yellow, obovate, emarginate, hairy above. Anther crest small, crenulate. Fruit tipped by persistent calyx.

South W. India. Common in wet, shaded, humid areas of the lower Ghats. April-June. *HFP* 2870. The plant is distinctive for the remarkable height it attains (5 m).

Note: The binomial accepted here is often attributed to Bentham (in Bentham and Hooker, *Gen. Pl.* 3: 644. 1883). However, Bentham only cited '*E* (*lettaria*) *cannaecarpum*' under *Amomum* without making the accepted combination required in Article 33 (I.C.B.N).

Amomum hypoleucum Thwaites, Enum. 318. 1861; Gamble, Fl. Madras 1487(1039). 1928.

Rhizome slender, extensively creeping. Leaf blade to 35×12 cm. Spikes with 1-3 yellowish flowers. Lip narrowed at base, frilled, reddish near throat, yellowish toward center with purple radiating striations.

South W. India, Sri Lanka. A rare plant collected once in moist densely shaded humid area in lower to middle Ghats (Kenchankumri State Forest). August. *HFP* 405.

Amomum microstephanum Baker in J. Hooker, Fl. Brit. India 6: 239. 1892; Gamble, Fl. Madras 1487(1039). 1928.

Rhizome thick, fleshy. Leaf blade to 65×8 cm. Lateral spike bracteate, many-flowered. Lip obovate, cuneate, crenulate, white, yellowish along the center. Fruit winged, bursting irregularly.

South W. India. Common in shaded, humid areas of the lower Ghats. May-June. *CJS* 14225, *HFP* 1701.

Note: The distinctive characters of *A. microstephanum* are the undulating wings in fruit and a broad, truncate anther crest. These characters are also found in *A. dealbatum* Roxb. (N. E. India). The North Indian and South Indian plants may prove to be conspecific.

BOESENBERGIA O. Kuntze

Spike secund, subterminal. Bracts not adnate, 2-ranked, each with

1 slightly shorter bracteole and 1 flower. Corolla tube slender, longer than bracts and with subequal lobes. Lateral staminodes rounded, equaling corolla lobes. Lip entire, concave. Stamen with filament equaling anther; connective shortly or not produced apically. Capsule with black, white-arillate seeds.

Fig. 114. *Boesenbergia pulcherrima*: *A*, habit; *Aa*, flower; *Ab*, same, without bracts and petals; *Ac*, flower in section; *Ad*, stamen, lateral staminodes and style.

Boesenbergia pulcherrima (Wallich) O. Kuntze, Rev. Gen. Pl. 685. 1891; Holttum, Gard. Bull. Straits Settlem. 13: 109. 1950. *Gastrochilus pulcherrima* Wallich, Pl. Asiat. Rar. 1: 22, t. 24. 1829; J. Hooker, Fl. Brit. India 6: 217. 1890.

Stem caulescent, roots tuberous, rhizome absent. Leaves glabrous, alternate, 4-6; petiole 6-8 cm, shorter than blade, broadly and striately sheathing nearly to base of blade and ending in auricles; ligule hyaline, transverse and narrow; blade unequal at base, elliptic, acute, from 7.5-18×5-7.5 cm. Spike included in upper leaf-sheaths. Floral bract to 3.5×1 cm. Calyx truncate, 0.4 cm long, hyaline. Corolla lobes white, about 1.5 cm. Anthers with longitudinal dehiscence; connective with a single short tip. Lip 2.5×1.5 cm, broad and concave, white with pink at center. Ovary 3-locular with 2 axillary ovules per locule.

Frequent in dense shade in wet, sandy to rocky localities, especially by streams in lower Ghats. June-September. *HFP* 2209.

Note: The Hassan plants do not develop a rhizome and have a truncate calyx. Wallich's illustration, however, shows a well-developed, creeping rhizome and a shortly 3-lobed calyx. A study of the specimens at Kew seems to suggest that the creeping rhizome may not always be present. Indeed, No. 6588 in Wallich's Herbarium, collected near Rangoon in 1826 (? type) has no rhizome but a number of tuberous roots as in the Hassan plants. Wallich's specimens have no flowers.

CURCUMA Roxburgh, *nom. cons. prop.*

Roots ending in globose tubers. Inflorescence appearing basal, spicate, dense, ending in a coma (tuft of basally connate bracts). Flowers 2-7, fascicled. Calyx hairy. Corolla tube hairy inside, funnel-shaped. Lip broad, slightly narrower toward base, apically 2-lobed; lateral staminodes 2, petaloid, obovate, adnate at base to the filament. Connective crested; anther spurred; filament flat. Fruit tardily dehiscing, globose, with many arillate seeds.

Curcuma neilgherrensis Wight, Ic. t. 2006. 1853; Gamble, Fl. Madras 1482(1936). 1928.

Leaf to 65×20 cm. Coma pink. Flowers yellow.

South W. India. Common in Ghats and western plains. Flowers appear before leaves. May-October. *CJS* 13481, *HFP* 2158.

Note: Gamble and Cooke use the position of inflorescence (lateral vs. central) as a key character to segregate species. Santapau (*Fl. Khandala* (1967) & *J. Bombay Nat. Hist. Soc.* 51: 35-39. 1952) points out that the above character is not a reliable one as he is able to show a gradation in the position of inflorescence from lateral (June-beginning August) lateral and central (first half of August) and central (August-October) as the season progresses, in the same plant (*C. pseudomontana* Graham). We are faced with an identical situation in our collection.

B. L. Burtt and R. M. Smith (*Taxon* 21: 709. 1972) have presented the reasons for conserving *Curcuma* Roxb. against *Curcuma* L.

ELETTARIA Maton

Ligule membranous. Inflorescence a basal prostrate panicle. Flowers 2-7, fascicled. Calyx membranous. Lip narrow, obovate, cuneate at base, crenulate; lateral staminodes represented by very narrow teeth. Stamens with a short filament; anthers very shortly spurred. Fruit globose, coriaceous, indehiscent with angular, non-arillate, black seeds.

Elettaria cardamomum (L.) Maton, Trans. Linn. Soc. London 10: 254. 1811; Gamble, Fl. Madras 1491(1041). 1928. *Amomum cardamomum* L., Sp. Pl. 1. 1753.

Leaf pubescent below, 35×4.5 cm. Petals white. Lip white, with purple at center.

South W. India, Sri Lanka. Rare in deep shade, near streams in the Ghats. June-September. *HFP* 1702. Extensively cultivated in the District as a cash crop for the valuable spice (cardamom) it yields.

GLOBBA Linnaeus

Ligule hairy. Inflorescence terminal, a raceme or contracted panicle. Flowers pedicelled, 2 to a bract. Lip linear, twice as long as the corolla, deeply bifid, ciliate at tip, deflexed. Lateral staminodes petaloid. Anther shortly spurred. Ovary globose, 1-locular; ovules parietal. Fruit tardily dehiscent with arillate seeds.

1 Anthers with bifid wings; bracts persistent.....*G. bulbifera*
1 Anthers without wings; bracts deciduous.....*G. ophioglossa*

Globba bulbifera Roxb., Asiat. Res. 11: 358. 1810; Gamble, Fl. Madras 1481(1035). 1928.

Leaf to 17×4.5 cm, oblong-lanceolate, acuminate, rounded at base. Flowers yellow. Anthers with bifid wings.

Indomalaysia. Occasional on moist, shaded sandy soil of upper Ghats. August-September. *CJS* 10079, *HFP* 803.

Note: *Globba canarensis* Baker is close to *G. bulbifera* and is distinguished by its bracts being distant, whereas in *G. bulbifera*, bracts are imbricate. This can be expected in the District.

Globba ophioglossa Wight, Ic. t. 2002. 1853; Gamble, Fl. Madras 1480(1035). 1928.

Leaf to 16×3 cm, lanceolate. Flowers yellow. Anthers not winged.

South W. India, Bihar. Fairly common in Ghats. June-November. *CJS* 10925, *HFP* 2872.

HEDYCHIUM Koenig

Inflorescence a terminal, strobiliform spike. Flowers 1-2 in a bract.

Calyx tubular, shorter than the bract. Lip orbicular-obcordate, bifid at apex. Lateral staminodes 2, petaloid, orbicular. Stamen with linear, 2-spurred anther on a slender filament. Fruit an oblong, glabrous, loculicidal capsule; seeds with crimson aril.

Hedychium coronarium Koenig in Retz., Obs. 3: 73. 1783; Gamble, Fl. Madras 1485(1037). 1928; Sant., Fl. Khandala ed. 3, 330. 1967.

Leaves to 42 × 5 cm. Bracts chartaceous, rounded, scarious-margined. Flowers white; corolla tube to 7 cm long. Lip broad, lobes rounded.

India, widely cultivated in tropics. Common near streams in upper Ghats. July-August. *CJS* 14030, 15460.

ZINGIBER Boehmer *nom. cons.*

Roots ending in globose tubers. Ligule ciliate or glabrous. Inflorescence a basal spike. Flowers solitary or paired. Calyx membranous. Lip large, with two smaller lateral lobes and a large central bifid lobe; staminal filament shorter than anther; anther cells spurless; connective prolonged. Fruit a loculicidal capsule with one valve larger than others, enclosed in bract; seeds dark, shining, covered with lacerate white aril.

1 Peduncle of spike very short, 5 (±3) cm.....*Z. cernuum*
1 Peduncle of spike long, 20 (±10) cm.
2 Spike short, 4 cm or less long; roots ending in globose tubers.....*Z. neesanum*
2 Spike elongate, 15 cm or more long; roots fibrous.....*Z. montanum*

Zingiber cernuum Dalzell, Hooker's J. Bot. Kew Gard. Misc. 4: 342. 1852; Sant., Fl. Khandala ed. 3, 274. 1967. *Alpinia nimmonii* Graham, Cat. Pl. Bomb. 206. 1839, *nom.* *Zingiber nimmonii* Dalz., Hooker's J. Bot. Kew Gard. Misc. 4: 341. 1852 ('*nimmoi*'); Gamble, Fl. Madras 1489(1040). 1928.

Leaf to 36 × 7.5 cm, lanceolate, pubescent below. Inflorescence a dense spike, shortly peduncled; bracts rounded at apex, streaked red. Lip white, blotched red. Capsule red; seeds many-angled, black.

Western Ghats. Common in shaded, moist, loose soil in the upper Ghats. July-August. *HFP* 301.

Note: The vexing question of the distinctness of *Z. nimmonii* from *Z. cernuum* has centered on the former having pubescent leaves and yellow flowers and the latter white flowers and glabrous leaves. Santapau (*l.c.*) after 10 years of field work and study at Kew concluded only further field work could settle the problem. Study of his comments, which agree with ours, suggests that leaf pubescence is unreliable and that the description of flowers as yellow is probably an error.

The spelling of the specific epithet honoring Nimmo needs discussion. A legitimate latinization is *Nimmonius* (gen. sing. *Nimmonii*), as originally used by Graham (1839).

Dalzell (1852), remade the latinization as *Nimmous* (gen. sing. *Nimmoi*) but changed this into *Nimmonius* (*Nimmonii*) in 1861 (Dalz. & Gibson, *Bombay Fl.*, p. 273).

Zingiber montanum (Koenig) Link ex A Dietrich, Sp. Pl. ed. 6, 1: 52. 1831; Burtt & Smith, Notes Roy. Bot. Gard. Edinburgh 31: 194. 1972. *Amomum montanum* Koenig in Retz., Obs. Bot. 3: 51. 1783. *Zingiber purpureum* Roscoe, Trans. Linn. Soc. London 8: 348. 1807; Alston in Trimen, Handb. Fl. Ceylon 6: 283. 1931; Backer & Bakh. f., Fl. Java 3: 44. 1968. *Zingiber cassumunar* Roxb., Asiat. Res. 11: 347, t. 5. 1810; Gamble, Fl. Madras 1490(1041). 1928; Holttum, Gard. Bull. Straits Settlem. 13: 58. 1950.

Leaf to 30×7.5 cm. Peduncle about 15 cm long. Bracts broadly ovate, acute, scarious along margin. Flowers white. Lip frilled along margin, pinkish. Capsule subglobose; seeds small, purple.

Indomalaysia. Collected thrice from the same locality at Kagenari State Forest (200-400 m) on moist, sandy, loose soil in shade. June-July. *HFP* 336, 1794.

Zingiber neesanum (Graham) Ramam. *comb. nov.*. *Alpinia neesana* Graham, Cat. Pl. Bombay 207. 1839. *Zingiber macrostachyum* Dalzell, Hooker's J. Bot. Kew Gard. Misc. 4: 342. 1852, *nom. superfl.*

Rhizome short with fleshy roots ending in globose tubers. Leaves 25×4 cm, lanceolate, acute-acuminate, glaucous-pubescent below, dark green to olive. Spike to 4 cm, dense with ovate, acute, greenish bracts, scarious along margin, turning bright red in fruit. Petals greenish-white. Lip obovate, yellowish-white, marked with purple lines; lateral lobes small. Capsule red, pubescent, with large, white-arillate, dark purple seeds.

South W. India. Common in moist, densely shaded areas, in the upper Ghats. Fruiting in September. *CJS* 14599, *HFP* 1047.

Note: We have only collected fruiting material.

Graham's name is validly published and cited by Dalzell. Dalzell erroneously cited the epithet as "Mesana" from "Meesum" instead of "neesana" from "Neesum" as done by Graham.

143. COSTACEAE

K. N. Gandhi

COSTUS Linnaeus

Perennial, tall, rarely branching herbs, with creeping tuberous root-stock and twisting stem so leaves appear spiralled. Leaves alternate, shortly petioled, simple, entire; sheath tubular, closed, ligulate; venation striate. Inflorescence a dense terminal cone-like spike, with spirally

arranged bracts. Flowers irregular, bisexual. Calyx tubular, 3-toothed. Corolla 3-lobed, flat, forming one of the petaloid structures. Stamen 1, the filament, together with the connective, forming an oblong petaloid process with contiguous, 2-celled, linear anther at its middle. Two staminodes combined in large, petaloid, suborbicular or obovate, marginally cuspid lip (labellum); other staminodes minute or 0. Ovary inferior, 3-locular; ovules many, axile, style filiform, erect; stigma with a crescent-shaped depression, hairy at sides. Fruit a globose, irregularly dehiscing capsule, with many, shortly arillate seeds.

Costus speciosus (Koenig) Smith, Trans. Linn. Soc. London 1: 249. 1791; Wight, Ic. t. 2014. 1853; Gamble, Fl. Madras 1490(1041). 1928. *Banksea speciosa* Koenig in Retz., Obs. Bot. 3: 75. 1783.

Leaves elliptic-obovate, to 30×8 cm, glabrous above, white-pubescent beneath. Bracts of inflorescence bright red. Calyx to 2 cm long, red; lobes ovate, ending in a hardened prickle 0.5 cm long. Petals elliptic, acute, 3-4×1.5-2 cm, pale pinkish or bluish-white. Lip to 6 cm across, hairy at base, white outside, yellow at center. Seeds globose.

Indomalaysia. Fairly common across Ghats. June-September. *CJS* 14442, *HFP* 2025.

144. CANNACEAE

K. N. Gandhi

CANNA Linnaeus

Perennial rhizomatous herbs with an erect stem. Leaves alternate, entire, ovate-lanceolate, sheathing; venation striate. Inflorescence a branching spike, bracteate. Flowers bisexual, irregular. Sepals 3, subequal, herbaceous, persistent. Petals 3, basally connate, narrow, colored, shorter than petaloid staminodes. Androecium highly modified, 3-5 segments petaloid. Stamen 1; anther 1-celled, attached to a petaloid structure. Ovary inferior, 3-locular; ovules many, axillary; style erect, flattened; stigma simple, oblique. Fruit a loculicidally 3-valved, warty capsule. Monotypic family.

Canna indica L., Sp. Pl. 1. 1753; Sant., Fl. Khandala ed. 3, 277. 1967. *Canna orientalis* Roscoe, Monandr. Pl. t. 12. 1824; Gamble, Fl. Madras 1495(1045). 1928.

Flowers paired, all parts shortly united above ovary. Sepals to 2.25×0.25 cm, reddish. Petals united. Staminodes about 6×1 cm, bright red. One staminode (lip) shorter, yellowish, increasingly red-blotched toward apex.

From Neotropics, now Pantropical. Cultivated and weakly escaping in middle to upper Ghats. All seasons. *CJS* 13684.

Note: The species in this genus hybridize and are hard to differentiate.

145. MARANTACEAE

K. N. Gandhi & T. P. Ramamoorthy

Perennial herbs or shrubs; stem creeping underground rhizome or erect and dichotomously branching; roots fleshy. Leaves alternate; petiole sheathing, pulvinate, without ligule; blade simple, entire, ovate-lanceolate, rounded at base, cuspidate at apex; venation striate. Inflorescence bracteate, paniculate or spicate. Flowers bisexual, irregular, white to pinkish, 2 to each bracteole. Sepals 3, free, equal. Petals connate, 3-lobed. Androecium in 2 whorls: inner whorl consisting of the stamen, the hooded (cucullate) staminode which envelops the style and stigma, and the fleshy (callose) staminode; the outer whorl of 1-2 petaloid staminodes, sometimes absent. Stamen with a 1-celled anther and a filament with a lateral petaloid appendage that may or may not be attached to the anther. Ovary inferior, 1-3-locular; ovules axillary, 1 per locule; style basally adnate to staminal filament, free above, dilated at apex into 3-lobed stigma. Fruit capsular or fleshy, indehiscent, with 1-3 arillate seeds.

1 Rootstock tuberous. Leaves subsessile. Inflorescence a profusely branched terminal panicle.....**Schumannianthus**

1 Rootstock creeping. Leaves long-petiolate. Inflorescence a spike.

2 Spike capitate; appearing lateral on petiole-like stem with one terminal leaf; bracts not imbricate.....**Phrynium**

2 Spike simple, ellipsoid, springing directly from the subterranean rhizome; bracts imbricate.....**Stachyphrynium**

PHRYNIUM Willdenow *nom. cons.*

Rhizome creeping with petiole-like aerial stems. Leaves solitary, rarely 2 in a sheath, long petiolate. Inflorescence a subsessile, subcapitate cluster of spikes appearing lateral on petiole-like stem. Sepals persistent. Corolla tube longer than sepals. Petaloid staminode 1, equaling the inner staminodes. Fruit a capsule.

Phrynium placentarium (Lour.) Merrill, Philipp. J. Sci. 15: 230. 1919; Backer & Bakh. f., Fl. Java 3: 80. 1968. *Phyllodes placentaria* Lour., Fl. Cochinch. 13. 1790. *Phrynium parviflorum* Roxb., Fl. Ind. 1: 7. 1820; Gamble, Fl. Madras 1494(1043). 1928.

Herbs to 1 m. Blade 32×18 cm; the sheath up to 40 cm. Spike close to the blade; inner bracts tapering to an acute tip. Flowers white, tipped

Fig. 115. MARANTACEAE. *A. Schumannianthus virgatus*: flowering twig; *Aa*, flower; *Ab*, staminode, stamen and gynoecium; *Ac*, section of ovary. *B. Phrynium placentarium*: flower.

with yellow. Corolla tube longer than lobes. Ovary pubescent at apex. Capsule oblong.

Indomalaysia. Common in undergrowth on loose, sandy, moist soil, across middle to lower Ghats. June-July. *HFP* 1792, 2212.

Note: *P. pubinerve* Blume (including *P. capitatum*) can be expected in lower Ghats.

SCHUMANNIANTHUS Gagnepain

Stem erect, septate, jointed, bamboo-like; roots tuberous. Leaves subsessile. Inflorescence a dichotomously branched panicle, terminating the culm. Sepals deciduous. Corolla tube much shorter than lobes and sepals. Petaloid staminodes 2, longer than the inner staminodes. Fruit subpyriform, green, indehiscent.

Schumannianthus virgatus (Roxb.) Rolfe, J. Bot. 14: 244. 1907; Gamble, Fl. Madras 1494(1043). 1928. *Phrynium virgatum* Roxb., Asiat. Res. 11: 324. 1810. *Maranta virgata* (Roxb.) Wall. ex Wight, Ic. t. 2015. 1853.

Plants to 4 m. Leaves 30×9 cm; petiole 1-3 cm. Bracteoles to 3 cm. Corolla 1.5 cm long, white. Ovary villous.

S. India, Sri Lanka. Common across Ghats. January-August. *CJS* 13456, *HFP* 49.

STACHYPHRYNIUM K. Schumann *nom. cons.*

Stem rhizomatous, creeping. Leaves radical; petiole simulating stem. Sheath scarious, 3/4 the petiole. Inflorescence a simple spike, sprouting directly from the rhizome. Corolla tube longer than lobes and sepals. Petaloid staminodes obovate, clawed, longer than the inner staminodes. Fruit a capsule.

Stachyphrynium spicatum (Roxb.) Schumann in Engl., Pflanzenr. 11: 46. 1902; Gamble, Fl. Madras 1494(1044). 1928. *Phrynium spicatum* Roxb., Fl. Ind. 1: 5. 1820.

Leaves 15×5 cm; petiole to 20 cm. Spike to 15 cm. Sepals 0.5 cm. Corolla white-pink, tube 2 cm.

South W. India. Fairly common on loose sandy, moist forest floor in lower Ghats. June-July. Remains in leaf for a long time. *HFP* 1785.

146. ARECACEAE (PALMAE)

T. P. Ramamoorthy & K. N. Gandhi

Erect trees or shrubs, rarely climbing, sometimes armed, monoecious

or dioecious. Leaves alternate, usually crowning the stem; petiole sheathing the stem; blade simply pinnate, sometimes bipinnate or palmate. Inflorescence a branched or simple spike, rarely a panicle, axillary, terminal or infrafoliar, enclosed in 1-many sheathing spathes. Flowers unisexual, rarely bisexual, regular, sessile or pedicelled. Outer tepals (sepals) 3, dry or coriaceous, usually imbricate and rounded, free or rarely connate, often accrescent. Inner tepals (petals) 3, like outer but valvate and acute, rarely persistent. Staminate flowers with 3-many stamens; pistillode none. Pistillate flower often with staminodes. Pistil usually superior, 3-locular; ovules 1 per locule, basal; stigmas 1-3, subsessile. Fruit a hard, coriaceous, rarely fleshy, drupe or berry; seed 1, rarely 2-3.

1 Leaves armed with hooks or spine-tipped leaflets.
 2 Stem climbing with hooked spines. Leaves scattered.....**Calamus**
 2 Style very short to 20 cm or erect to 15 m. Leaves crowning the stem....**Phoenix**
1 Leaves unarmed.
 3 Leaflets white beneath, auriculate at base.....**Arenga**
 3 Leaflets not white below, not auriculate.
  4 Leaves bipinnate; stem thick (40 cm across).....**Caryota**
  4 Leaves pinnate: stem thin (10 cm across).....**Pinanga**

ARENGA Labillardiere

Trees monoecious. Stem stout, clothed above with reticulate, fibrous leaf sheath. Leaves pinnatisect; petiole with fiber developing in the middle of the channel; leaflets alternate, auricled at base, acute at apex, white beneath. Inflorescence basipetal (opening from apex downward). Spathes many, green, tubular. Staminate and pistillate spadices separate; rarely flowers ternate (Pistillate flower between two staminates). Stamens many. Staminodes 0 or many. Ovary 3-locular. Fruit a hard, green, globular berry; seeds 2-3.

Arenga wightii Griffith, Calcutta J. Nat. Hist. 5: 475. 1845; Gamble, Fl. Madras 1558(1087). 1931.

Stem smooth, grey, 8 m × 30 cm. Leaves 9 m long; petiole 4 m; leaflets attenuate, 80 × 5 cm; auricles unequal. Spadix 1 m long. Fruit 3 cm across.

South W. India.. Fairly common in lower Ghats. Flowering in the hot season (May). The juice of fruit causes severe itching and blisters. *CJS* 16818, *HFP* 125.

CALAMUS Linnaeus

Armed, dioecious climbers with hooked spines. Leaves odd- or even-pinnate; leaf sheath cylindrical, spiny, ochreate, with or without an

elongate, lateral, clawed flagellum; petiole and rachis spiny or prickled, sometimes ending in flagellum; leaflets clustered or equidistant, 1-few-ribbed with secondary nerves and transverse veinlets, bristly or ciliate on the ribs and margin or naked. Inflorescence axillary, very elongate, often ending in a clawed flagellum. Spathes many, passing into bracts and bracteoles. Flowers unisexual, polygamo-dioecious, solitary or binate (a pistillate with a staminate), small, gathered into distichous or scorpioid spikelets, bracteolate. Calyx cupular, 3-toothed. Petals longer than calyx, free in staminate, tubular in pistillate. Stamens 6; filaments connate. Staminodes cupular. Ovary incompletely 3-locular, covered with scales. Drupes covered with numerous, polished scales.

1 Leaf blade with fascicles of black, flat spines. Leaflets subfascicled near middle, 1-ribbed.....*C. thwaitesii*
1 Leaf base with scattered spines (not black). Leaflets equidistant throughout, 3-ribbed.
2 Ochrea more than 12 cm long. Leaf sheath with needle-like spines. Fruits sessile; stigma deciduous or indistinct.....*C. pseudotenuis*
2 Ochrea less than 8 cm long. Leaf sheath with flat, scurfy spines. Fruits pedicelled; stigma persistent, distinct.....*C. huegelianus*

Calamus huegelianus Martius, Hist. Nat. Palm. 3: t. Z(xii), f. 3. 1849; *ibid.* 338. 1853; Beccari, Ann. Roy. Bot. Gard. (Calcutta) 11: 314. t. 122. 1908; Gamble, Fl. Madras 1568(1094). 1931.

Petiole 40 cm, with solitary, flat spines; rachis 1.6 m long, trigonous upward, armed with claws; leaflets long-acuminate, with long bristles on the 3 ribs, ciliate on the margin, 65×2.5 cm. Fruit spherical.

South W. India. Collected only once in fruit at Kagenari State Forest in lower Shiradi Ghat on February 18, 1972. *HFP* 2668.

Calamus pseudotenuis Beccari ex Beccari & J. Hooker in J. Hooker, Fl. Brit. India 6: 445. 1892; Beccari, Ann. Roy. Bot. Gard. (Calcutta) 11: 223, t. 69. 1908; Gamble, Fl. Madras 1567(1093). 1931.

Spines on the leaf sheath, petiole and rachis needle-like. Petiole 20 cm long; rachis 1.5 m long, trigonous. Leaflets penicellate at apex, 50×2.5 cm with or without short bristles on the ribs and margin. Drupes brown, globular, apiculate.

South W. India, Sri Lanka. Common in middle and upper Ghats (Vanagur, Hanbal). All seasons. *HFP* 1442, 2862.

Calamus thwaitesii Beccari ex Beccari & J. Hooker in J. Hooker, Fl. Brit. India 6: 441. 1892.

var. **canaranus** Beccari, Ann. Roy. Bot. Gard. (Calcutta) 11: 138, t. 12. 1908; Gamble, Fl. Madras 1567(1093). 1931.

Leaf sheath flagelliferous. Petiole 40 cm long, with seriate, black, flat, pointed spines. Rachis channeled, trigonous above, 1.6 m long,

with solitary or ternate, deflexed, black spines. Leaflets broadly ensiform, to 60×6 cm with black short bristles on the midrib and margin. Male spadix flagelliferous. Primary spathe tubular with black-tipped spines; secondary spathe split upward. Drupes yellowish-brown, beaked.

South W. India. Locally common in lower and middle Shiradi Ghat (Kenchankumri State Forest). *HFP* 1493, 2833.

Note: *C. nagbettai* Fernandez & Dey (*Indian Forester* 90: 223. 1970), with flat, black spines but with leaf rachis flagelliferous and leaf sheath eflagelliferous, has been described from forests of Coorg and South Kanara and can be expected in Hassan District.

CARYOTA Linnaeus

Trees, monoecious. Leaves bipinnate; leaflets cuneate or fan-shaped, entire, praemorse (ragged) at apex, many-ribbed. Inflorescence shortly peduncled; branches pendulous. Spathes few. Flowers unisexual, solitary and staminate or ternate (a pistillate between 2 staminates). Petals acute in staminate, round in pistillate. Stamens many. Staminodes 0-6. Ovary 3-locular. Berry brownish-black, globular, smooth, 2 cm across, 1-2-seeded.

Caryota urens L., Sp. Pl. 1189. 1753; Gamble, Fl. Madras 1560(1089). 1931.

Stem smooth, shining, to 20×0.5 m; leaves 6 m long; pinnae 2 m long; leaflets 30×10 cm. Inflorescence 3-4 m long. Spathe to 40 cm long. Pistillate flowers longer than staminate flowers.

Tropical Asia. Common across Ghats. All seasons. One of the Palms usually tapped for toddy. *CJS* 12526, 14428.

PHOENIX Linnaeus

Shrubs or trees, dioecious. Stem very short to 6 m tall, covered with persistent leaf-bases. Leaves crowning the stem; leaflets fascicled, subglaucous, the basal ones modified into spines. Spathe marcescent. Flowers unisexual. Sepals united. Stamens 3-6; anthers linear. Staminodes 6 or a 6-lobed cup. Pistils 3, each uniovulate. Drupe 1-seeded, fleshy, orange-red, turning black with age; seed hard, ventrally grooved.

1 Stem to 0.2 m; peduncle of pistillate spadix over 1 m long.....*P. humilis*
1 Stem to 10 m; peduncle of pistillate spadix 0.2 m.....*P. sylvestris*

Phoenix humilis Royle, Illustr. Himal. 394, 397, 399. 1840.

var. **pedunculata** Beccari, Males. 3: 379, 387, t. 44, f. 13-15, 18-21, 25-27. 1890; Gamble, Fl. Madras 1560(1088). 1931.

Stem very short or none. Staminate spadix to 40 cm; pistillate spadix to 1.2 m with a long peduncle.

South W. India. Common on open slopes of western plains. Flowers September-October, fruits to April-May. Drupe edible. *HFP* 2145, 2745.

Phoenix sylvestris (L.) Roxb., Fl. Ind. 3: 787. 1832; Gamble, Fl. Madras 1559(1088). 1931. *Elate sylvestris* L., Sp. Pl. 1189. 1753.

Tree to 10 m. Stem cylindrical, to 40 cm across. Staminate spadix to 1 m; pistillate spadix to 1 m, with very short peduncle.

Throughout India and Burma. Common on banks of tanks, bunds of paddy fields and along roadsides across plains. Flowers October-December; fruits to February. Tapped for toddy. Drupe edible. *CJS* 16294, *HFP* 1222.

PINANGA Blume

Slender, monoecious trees. Leaves crowning the stem; leaflets opposite, broadest at the base, confluent toward apex, praemorse at tip, commonly 8-ribbed. Spathe solitary. Flowers ternate (a pistillate between 2 staminate flowers). Stamens many. Staminodes 6. Ovary 1-locular, 1-ovuled. Drupe obconical with fibrous pericarp, 1-seeded.

Pinanga dicksonii (Roxb.) Scheffer, Naturk. Tijdschr. Nederl. Ind. 32: 174. 1871; Gamble, Fl. Madras 1556(1086). 1931. *Areca dicksonii* Roxb., Fl. Ind. 3: 616. 1832.

Stem annulate, smooth, green, 7 m×3 cm. Leaves 1.5-2 m; leaflets 60×3 cm. Spikes 20 cm long.

South W. India. Common across Ghats. Fruits February-April. *CJS* 13164, *HFP* 2667.

* * *

Areca catechu L. (betel nut tree) and *Cocos nucifera* L. (coconut) are commonly cultivated in the District.

147. PANDANACEAE

B. C. Stone

PANDANUS S. Parkinson

Erect dioecious shrubs or trees, sometimes with stilt roots. Leaves crowded in tristichous spirals, sessile, ensiform, long acuminate-caudate, sheathing at base; mid-nerve keel-like, with spines up- or down-pointed; spines on margin mostly up-pointed; twin upper pleats (near apex) armed

or not. Staminate inflorescence a terminal, branched spadix, each branch subtended by a spathe; perianth 0; stamens many, lateral or terminal on stemonophores or attached directly to spadix; pistillode 0. Pistillate inflorescence a dense, simple or compound spadix, (cephalium) subtended by withering spathes; pistils naked, connate in groups (phalanges) or all free; each pistil with cavities in upper portion, 1-locular, with 1 central or basal ovule within an osseous endocarp; style terminal, or none, if present sometimes forked, with lateral or subterminal dorsal or ventral stigmas. Fruiting head an aggregate of drupes or of phalanges.

Note: Staminate material is difficult to obtain because it is much favored and collected for its fragrant inflorescences used by ladies in their hair. Another difficulty is matching pistillate and staminate plants of the same species when an entire population seems to be of one sex or the other, a condition sometimes real (as in cultivation from cuttings) or, in nature, spurious, as staminate flowering is seasonal and brief.

1 Specimen pistillate.
2 Carpels aggregated into phalanges, the common endocarp mostly 2-15-celled.....*P. fascicularis*
2 Carpels free, ripening as 1-celled drupes (very rarely a few fused).
3 Stigmatic surface linearly grooved on the dorsal side of the forwardly deflected or suberect spiniform style. Cephalia usually spicate, 2-5. Leaf apex with upper twin pleats armed with prickles.....*P. thwaitesii*
3 Stigmatic surface narrowly or broadly ovate to deltoid or forked in conjunction with the style, always ventral on forwardly directed style. Cephalia usually solitary. Leaf bases becoming bronze-purplish; apical pleats unarmed above....*P. canaranus*

1 Specimen staminate.
4 Anthers 15-20 mm long, subsessile, singly disposed on spike axis. Leaf apex with upper twin pleats armed with prickles.....*P. thwaitesii*
4 Anthers less than 10 mm long, on short filaments, disposed in phalanges which are crowded on the spike. Leaf apex with upper twin pleats unarmed.
5 Stamens racemosely disposed on stemonophore; inflorescence bracts white to cream-colored.....*P. fascicularis*
5 Stamens umbellate at apex of stemonophore; inflorescence bracts yellow or yellowish cream (?).....*P. canaranus*

Pandanus canaranus Warburg in Engler, Pflanzenr. Iv. 9: 75, f. 21E. 1900; Gamble, Fl. Madras 1570(1095). 1931; St. John, Bot. Mag. Tokyo 85: 242, fig. 1. 1972.

Trees to 8 m, often branching near top; leaves 1.5 m × 5 cm. Staminate spathes fragrant, lower ones flagelliferous; spikes to 11 cm; anthers 10-16, clustered on top of stemonophore. Style flattened, often sharply bent at right angles and bilobed; stigmas acroscopic (facing toward apex of cephalium). Drupes at first coherent, 3-5 cm long; endocarp 2-3 cm long.

South India. Common in marshes of upper Ghats. *CJS* 15435 (♂), *HFP* 1434 (♂), 2676 (♀), 2849 (♀).

Note: Staminate materials of *P. furcatus* Roxb. and *P. kaida* S. Kurz are easily confused with this species and need further study. *P. furcatus*, a closely related species known from S. W. India, is much larger in most parts, with bracts 10-12 cm wide and spikes 20 or more

Fig. 116. PANDANACEAE. *A. Pandanus fascicularis*: Staminate inflorescence; *Aa*, stemonophore with lateral anthers; *Ab*, an anther. *B. Pandanus thwaitesii*: free stamens; *Ba*, an anther. *C. Pandanus canaranus*: coherent drupes; *Ca*, vertical section of drupe.

cm long. Pistillate material of *P. kaida* is phalangiate like *P. fascicularis*. In *P. canaranus* the pileus (apex of drupe) is steeply conic to pyramidal while in *P. furcatus* the pileus is broadly pyramidal. In *P. furcatus* the leaves are broader, 8-12 cm wide. *P. furcatus* is to be expected in hill forests on dryland while *P. canaranus* is a marsh or riverside plant.

Pandanus fascicularis Lamarck, Encycl. 1: 372. 1785; J. Hooker, Fl. Brit. Ind. 6: 485. 1893; Ramaswamy & Razi, Fl. Bangalore Distr. 2. 1973. *P. odoratissimus* L. f., Suppl. 424. 1781, nom. superfl. et illegit.: Stone, Gard. Bull. Straits Settlem. 22: 236. 1967. *P. tectorius* sensu lato of many authors: Gamble, Fl. Madras 1570(1095). 1931, but not sensu stricto of Solander ex S. Parkinson, J. Voy. Endeavor 46. 1773 and ex "Z." in Der Naturforscher, 1774.

A much branched, bushy shrub or small tree. Leaves 1-2.5 m×3-9 cm. Staminate spikes less than 5 cm, fragrant. Stemonophores with racemose anthers. Drupes connate in phalanges 4-7 cm long, yellowish to livid orange with age.

Central Malaysia through India. Fairly common on western plains.

Note: The phalanges of *P. kaida* S. Kurz, to be sought on rice paddy bunds, has 2-3 (-5)-celled phalanges, unlike the (5-)7(-15)-celled phalanges of *P. fascicularis*. It is difficult to tell male *P. kaida* from male *P. canaranus*, but *P. fascicularis* is easily distinguished by the racemosely disposed stamens.

Many botanists have used the above names erroneously, often misapplying them to distinct species such as *P. kaida*. Setting aside such misidentifications, there remains a problem of classification, the relationship of *P. tectorius* (based on Tahitian material) and *P. fascicularis* (based on Malabar material). The Polynesian *P. tectorius* can be discriminated by its smaller, green leaf-margin teeth and the lack of the conspicuous fleshy shoulders which characterize the fully ripe pistillate phalanges of *P. fascicularis*. These two taxa are approximately divided by "Wallace's Line." At the moment these taxa are regarded as species but it is not impossible to regard them as subspecies. If the latter classification were followed, then the older name (*P. tectorius*) would be applicable to Indian material. No one has established a name at subspecific rank, but *P. tectorius* var. *littoralis* Hasskarl refers to this taxon.

Another problem involves identification of *Keura odorifera* Forsk. (1775), a name based on a staminate inflorescence purchased in an Arabian shop by Forskal. This early name must remain as a *nomen dubium* until the type is studied and compared with known taxa. It may prove to be pertinent to *P. fascicularis* Lamarck (1785).

Pandanus thwaitesii Martelli, Bull. Soc. Bot. Ital. 369. 1904; Gamble, Fl. Madras 1570(1095). 1931.

Arborescent, unbranched shrubs to 4 m. Leaves 2 m×5 cm. Male spathes fragrant, yellow. Stamens directly attached to axis, not on stemonophores; anthers elongated, to 2 cm long. Drupes oblanceoloid; pileus conic, produced into spiniform style with dorsal linear stigma.

S. India. Upper Bisle Ghat (Athihalli). July-October. *CJS* 15293, *HFP* 2155 (♂).

Note: This species apparently differs from *P. foetidus* Roxb. by its spicately arranged fruiting heads which are smaller than the solitary head of *P. foetidus*, and its smaller drupes.

* * *

The following may occur in cultivation:

P. tectorius var. *laevis* Warb. (*P. spurius* Miq.) is probably to be found in cultivation; it is recognized by its completely unarmed leaves. Otherwise it resembles *P. fascicularis*.

P. tectorius var. *sanderi* Hort. Like the above but with armed, variegated leaves. A similar form is called *P. veitchii*.

P. amaryllifolius Roxb. Cultivated for its scented musk-odored leaves (not flowers); known in Ceylon (in cult.) but apparently a Malaysian plant; it rarely or never flowers and fruits have never been seen. (Cfr. Stone, Pandanaceae, in *Flora of Ceylon* ed. Abeywickrama, in press).

148. ARACEAE

D. H. Nicolson

Herbaceous perennials. Leaves or leaflets entire, usually glabrous; venation usually reticulate. Inflorescence a pseudanthoid spike (spadix) surrounded by a single, membranous bract (spathe). Flowers regular, usually unisexual and naked. Stamens up to six, sometimes fused into synandria. Ovary superior, usually 1-locular.

1 Plants root climbers with chartaceous leaves; flowers bisexual.
2 Leaf blade ovate; petiole not winged; flowers naked.....**Rhaphidophora**
2 Leaf blade lanceolate; petiole alate; flowers with six tepals.....**Pothos**
1 Plants not climbing, with membranous leaves; flowers unisexual.
3 Floating aquatics with flabellate, pubescent leaves.....**Pistia**
3 Terrestrial plants with glabrous leaves.
4 Leaves compound or deeply lobed.
5 Plants with inflorescence and leaves simultaneous; staminate flowers scattered.....**Arisaema**
5 Plants with inflorescence preceding the leaf; staminate flowers densely packed.
6 Leaf pedately 7-9-lobed; lower spathe margins fused into a tube....**Sauromatum**
6 Leaf ternately divided and dichotomously decompound; lower spathe margins overlapping.....**Amorphophallus**
4 Leaves simple.
7 Creeping plants with lanceolate to elliptic leaves; venation striate and undifferentiated.
8 Leaves linear-lanceolate; ovaries few, in a single whorl.....**Cryptocoryne**
8 Leaves elliptic; ovaries many, spiralled.....**Lagenandra**

7 Cormous or erect plants with broad, deeply cordate to peltate leaves; venation differentiated into primary and secondary.
9 Plants subepiphytic and deciduous; spadix without appendix.
10 Plants with bulbiferous shoots; lower spathe accrescent.....**Remusatia**
10 Plants without bulbils; entire spathe marcescent.....**Ariopsis**
9 Plants terrestrial and evergreen; spadix with a naked appendix.
11 Ovules many, parietal; plants of mud and marsh.....**Colocasia**
11 Ovules few, basal; plants of moist humus.....**Alocasia**

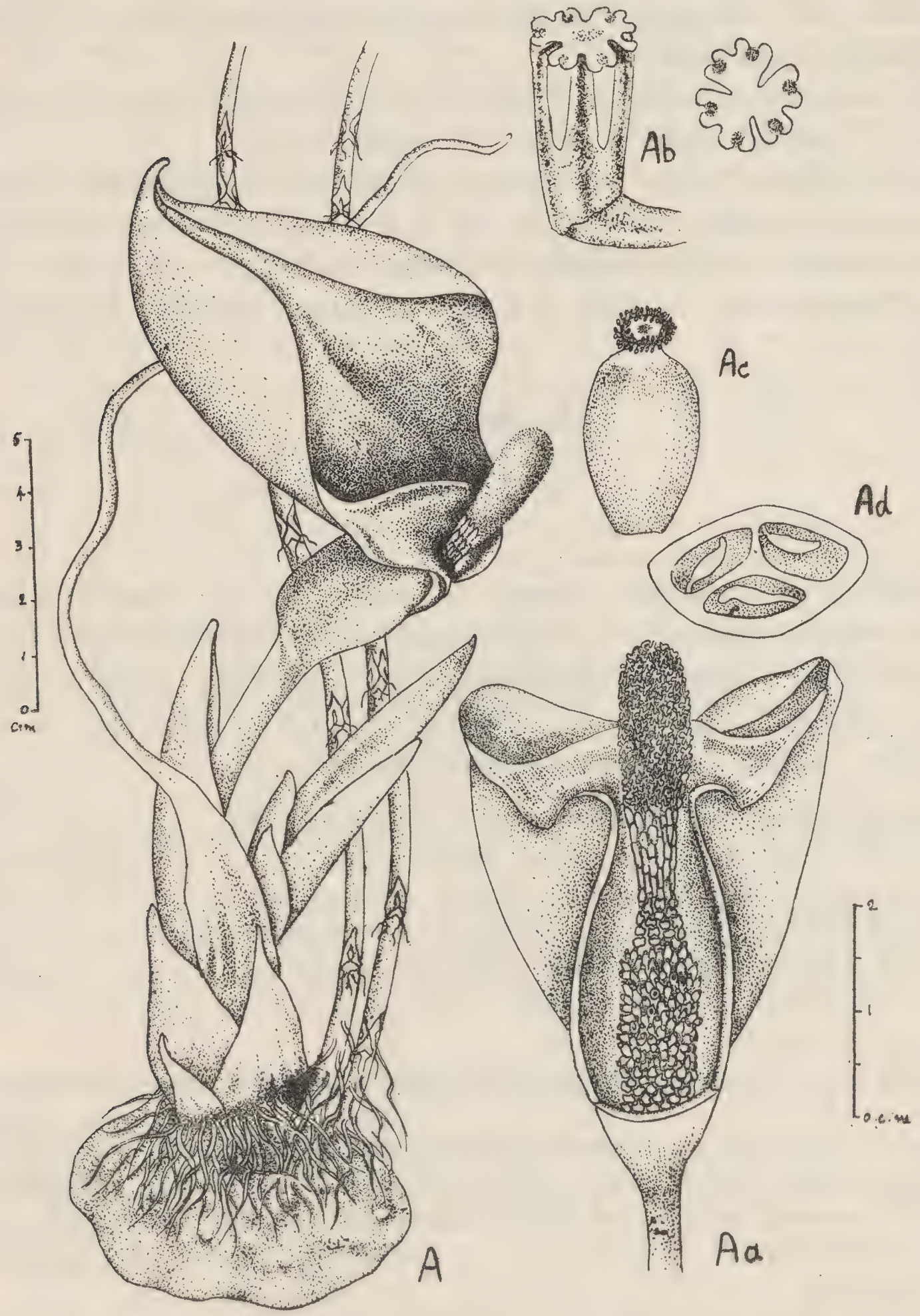


Fig. 117. ARACEAE: *Remusatia vivipara*: *A*, flowering plant; *Aa*, spathe cut open to show spadix; *Ab*, synandrium; *Ac*, female flower; *Ad*, section of ovary.

ALOCASIA (Schott) G. Don *nom. cons.*

Leaf simple, narrowly to broadly ovate with pinnate primary veins with convergent secondary veins forming a collective vein between and parallel to the primary veins. Upper spathe deciduous, lower part accrescent. Spadix sessile, in four parts: pistillate at base, sterile at spathe constriction, staminate, and with naked appendix. Stamens in synandria. Ovules 3-5, basal, orthotropous. Berries with large, globose seeds.

Alocasia fornicata (Roxb.) Schott, Oesterr. Bot. Wochenbl. 4: 410. 1854; Balakrishnan, Bull. Bot. Surv. India 6: 91. 1964. *Arum fornicatum* Roxb., Fl. Ind. 3: 501. 1832; Wight, Ic. t. 792. 1844.

Notable for rather elongate, sagittate leaves, peltate for 1.5-2 cm; anterior lobe 17-21 × 11-14 cm wide, acuminate; basal lobes 9-12 cm long. Peduncles 6-25 cm long.

N. E. India, Andhra and now Karnataka. Rare but locally abundant along fast stream in lower Bisle Ghat. June-July. *Nicolson* 4157, *HFP* 1886.

AMORPHOPHALLUS Blume ex Decaisne *nom. cons.*

Deciduous, cormous herbs flowering before leaves. Leaf solitary, 3-fid at the base and each segment thereafter dichotomously dividing. Spathe entirely withering. Spadix sessile, in three parts: pistillate at base, staminate in middle, with a naked appendix. Ovary 1-4-locular; ovule 1, subbasal. Berries with subglobose seeds.

1 Leaf with bulbil at major intersections of leaflets; peduncle elongate, exceeding spathe and spadix in length; appendix creamy, elongate.....*A. bulbifer*
1 Leaf not bulbiferous; peduncle shorter than spathe or spadix; appendix dark red, ovoid .....*A. campanulatus*

Amorphophallus bulbifer (Roxb.) Bl., Rumphia 1: 148. 1837; Gamble, Fl. Madras 1587(1107). 1931. *Arum bulbiferum* Roxb., Fl. Ind. 3: 510. 1832.

Petiole smooth. Leaf bulbiferous. Peduncle at least 50 cm long. Stigma essentially sessile. Appendix elongate, pale. Spathe to 15 × 12 cm.

India, Burma. Occasional in shade on clayey soil in lower Shiradi Ghat (Kenchankumri) 490 m. Early monsoon (June). *HFP* 1768.

Amorphophallus campanulatus (Roxb.) Bl. ex Decaisne, Nouv. Ann. Mus. Paris 3: 366. 1834; Gamble, Fl. Madras 1587(1107). 1931. *Arum campanulatum* Roxb., Pl. Cor. t. 272. 1820; Wight, Ic. t. 782, 785. 1844.

Petiole warty (said to be smooth in cultivars). Inflorescence virtually sessile on ground (peduncle only 3 cm long). Styles up to 1 cm long. Appendix subglobose, dark red. Spathe light reddish to pink.

Indomalaysia. Occasional near homes at upper Ghats (Harihalli, Kenchankumri). Early monsoon (June). Often cultivated. *HFP* 1738, 1772.

ARIOPSIS Nimmo

Cormous, deciduous herb. Leaf simple, suborbicular, peltate; venation subpalmate. Spathe entirely withering, whitish to purplish. Spadix in two parts: pistillate with few flowers adnate to spathe and staminate part free from spathe. Stamens in synandria each with pollen released introrsely into a common central pore, the synandria fused. Ovules many, parietal.

Ariopsis peltata Nimmo in Graham, Cat. Pl. Bombay 252. 1839; Gamble, Fl. Madras 1580(1102). 1931. *Remusatia vivipara* auct. non. Schott, 1832: Wight, Ic. t. 900. 1845.

Peduncle to 10 cm. Spathe 1-1.5 cm long. Spadix 1 cm.

Subtropical Himalaya and Western Ghats. Locally abundant, often on rocks in Ghats (Kempuhole, Bisle Panorama Point). Leaves and flowers in early monsoon (June-July), fruits June-August and becomes dormant. *HFP* 452, 1884.

ARISAEMA Martius

Cormous, deciduous herbs. Leaves 1-2, compound. Spathe entirely withering, blade arching forward. Spadix base covered with densely packed pistillate flowers, or scattered staminate flowers, or with both sexes on the same spadix, always with a naked appendix. Staminate flowers with several stamens fasciculate by their filaments. Ovules few, basal. Berries with globose seeds.

Note: Most species of *Arisaema* are paradioecious, young plants producing only staminate flowers and older plants producing pistillate flowers. *Arisaema flavum* Schott of northwestern India across Arabia is completely monoecious. *Arisaema tortuosum* is intermediate, all inflorescences reported being either purely staminate or monoecious, never purely pistillate (*Kew Bull.* 349. 1933).

1 Spadix included, erect spathe purplish (ours) with translucent white lines..... .....*A. leschenaultii*

1 Spadix longer than spathe or equaling spadix, procurved to sigmoid; spathe green to whitish.....*A. tortuosum*

Arisaema leschenaultii Bl., Rumphia 1: 93. 1836; Gamble, Fl. Madras 1585(1105). 1931.

Leaves solitary, radiatisect. Spathe to 16 cm long, the overlapping portion 6 cm and the blade 10 × 5-6 cm, including a 4 cm acumen. Spadix sessile, 5-6.5 cm long, often with acicular sterile flowers above the fertile; the appendix blunt at apex.

South W. India. Occasional across middle & upper Ghats. Flower and leaf in early monsoon (June), fruits August-October and becomes dormant. *CJS* 14793, *HFP* 517. (Plate 10).

Arisaema tortuosum (Wall.) Schott in Schott & Endl., Melet. Bot. 17. 1832; Gamble, Fl. Madras 1584(1105). 1931. *Arum tortuosum* Wall., Pl. As. Rar. 2: 10, t. 111. 1830. *Arum curvatum* Roxb., Fl. Ind. 3: 506. 1832; Wight, Ic. t. 788. 1844.

1 Spadix long-exserted, sigmoid; leaves 2, pedatisect.....var. *tortuosum*
1 Spadix equaling spathe, procurved; leaf 1, radiatisect.....var. *neglectum*

var. **tortuosum**

Spathe greenish to purplish, fading white, 11-15 cm long, overlapping for 4-5 cm; blade 7-10 cm long. Spadix sigmoid, 20-25 cm long, fertile in lower 2-5-6.5 cm, lowest 1-2 cm is pistillate and staminate portion is 2-5 cm long and more or less separated from pistillate portion; appendix often purple.

Himalayas, W. Ghats. Across upper Ghats and western plains. June-November and becomes dormant. *CJS* 14520, *HFP* 2128.

var. **neglectum** (Schott) Fischer in Gamble, Fl. Madras 1585(1105). 1931. *Arisaema neglectum* Schott, Bonplandia 26. 1859.

Spathe green to white, 8-13 cm long. Spadix 8-14 cm long, procurved.

South W. India, Sri Lanka. Occasional across lower to middle Ghats. Flowering as typical variety. *HFP* 1666, 1740.

Note: This variety may represent a hybrid between *A. leschenaultii* and *A. tortuosum*. The leaves are mostly solitary and radiatisect like *A. leschenaultii* but the spadix equals the spathe, rather like a reduced *A. tortuosum*. Even J. Hooker (*Fl. Brit. India* 6: 504. 1893) comments that the spathe is "remarkably like that of *A. tortuosum*."

On the coast (Mangalore) there are populations of this, a rare occasion in the tropics where the temperate genus *Arisaema* comes down to the sea. Dr. F. R. Fosberg says that he has seen this in Sri Lanka.

COLOCASIA Clusius ex Fabricius *nom. cons.*

Rhizome swollen, subterranean, often stoloniferous. Leaf ovate, peltate; venation reticulate with primary veins producing secondaries which merge into a collective vein midway between and parallel to the primaries. Spathe in two parts: the lower green and accrescent, the upper elongate, yellow and deciduous. Spadix in four parts: lower pistillate with scattered sterile flowers, an interstice with sterile flowers at the spathe

constriction, staminate portion often elongated, and a terminal naked appendix which is often short. Staminate flowers in synandria. Ovules many, parietal, anatropous. Seeds elongate.

Colocasia esculenta (L.) Schott in Schott & Endl., Melet. Bot. 18. 1832; Sant., Fl. Khandala ed. 3, 293. 1967. *Arum esculentum* L., Sp. Pl. 965. 1753. *Colocasia antiquorum* Schott in Schott & Endl., Melet. Bot. 18. 1832; Gamble, Fl. Madras 1580(1102). 1931.

Spathe to 30 cm long, yellow. Spadix to 15 cm.

Originating in tropical Asia but pantropically cultivated. Locally abundant in marshy places across District. May-October, apparently not setting fruit. Many cultivars have been described (Porteres, *J. Agric. Trop. Bot. Appl.* 7: 169-192. 1960). *CJS* 13654, *HFP* 2000.

CRYPTOCORYNE Fischer ex Wydler

Rhizomatous, aquatic, deciduous herbs. Leaf simple, linear with striate, undifferentiated venation. Spathe an elongate tube with a twisted blade. Spadix short, in three parts: 1 whorl of pistillate flowers, a naked, filamentous interstice, and a densely packed staminate portion. The apex of the spadix is adherent to a deflexed ligule within the spathe-tube. Ovules many; styles decurved. Fruit drying and becoming multiple.

Cryptocoryne retrospiralis (Roxb.) Kunth, Enum. 3: 12. 1841; Wight, Ic. t. 772. 1844. *Ambrosinia retrospiralis* Roxb., Fl. Ind. 3: 492. 1832.

Peduncle 1 cm long. Spathe to 10 cm long, twisted. Spadix 1 cm long.

Reported from Deccan to Burma. Locally abundant along rivers in Ghats (Kempuhole, Vanagur) and plains (Hemavathy). Flowers and leaves in October-February, after the monsoon. *CJS* 12079, *HFP* 1235. (Plate 11).

Note: This genus is normally divided into species with spathe tube much shorter than spathe blade as opposed to those with tube much longer than blade. This character needs field study as it may be environmentally determined by the depth of the water at a critical time or the amount of time elapsed before pollination. All specimens seen from Hassan have a long, commonly twisted tube and a short twisted blade.

LAGENANDRA Dalzell

Rhizomatous, aquatic, evergreen herbs. Leaves ovate to lanceolate with striate, undifferentiated venation. Spathe all withering but divided into three parts: lower tubular with spadix, middle opening, and a caudate,

erect appendage. Spadix divided in three parts: lower pistillate with many, spirally arranged pistils, the naked filamentous interstice, the upper part staminate and adherent to an internal ligule of the spathe. Ovules few-many, basal. Fruit multiple, reported to be explosively dehiscent. Seeds oblong.

1 Spathe slit less than 2.5 cm long, not running up the caudate spathe; spathe verruculose outside ..... *L. meeboldii*

1 Spathe slit over 5 cm long, running far up the caudate spathe; spathe smooth outside ..... *L. ovata*

Lagenandra meeboldii (Engler) Fischer in Gamble, Fl. Madras 1575 (1099). 1931. *Cryptocoryne meeboldii* Engl., Pflanzenr. 71: 234. 1920.

Plants relatively small. Bracts 4-6 cm long, narrowly bicarinate. Leaf blade 6.5-10 × 3.7-6 cm, cordate-emarginate. Spathe 10-11 cm long.

South W. India. Locally abundant around tanks and streams near rice fields of upper Ghats (Athihalli, Maranahalli, Devarunde). Major flowering in winter (December) until monsoon (June). *CJS* 15277, *HFP* 52.

Note: The differences between *L. meeboldii* and *L. ovata* are matters of degree. At Devarunde I have seen flowering material of both taxa on opposite sides of valley full of rice fields. My impression was that they were simply two different populations of a variable species.

Santapau (*J. Bombay Nat Hist. Soc.* 54: 967-969. 1957) points out the discrepancy between Engler's original description of *Cryptocoryne meeboldii* (*inflorescentia femina* 4-5-*gyna*) and the illustration (figures 61A-B) which shows 25-30 ovaries. The type was destroyed with the Berlin Herbarium. Our field work indicates that there is a taxon of *Lagenandra* in Karnataka that fits the illustration but no taxon of *Cryptocoryne* that fits the description. Hence, we conclude that Engler's description of the pistillate inflorescence as 4-5-gynous is an error for what should have been 24-25-gynous. Engler's description applies to our taxon in all other particulars.

Lagenandra ovata (L.) Thwaites, Enum. 334. 1864; Gamble, Fl. Madras 1575(1099). 1931. *Arum ovatum* L., Sp. Pl. 967. 1753. *Lagenandra toxicaria* Dalzell, Hooker's J. Bot. Kew Gard. Misc. 4: 289. 1852; 5: t, 4. 1853.

Plants relatively large. Bracts 8-15 cm long, bicarinate. Leaf blades 10-35 × 5.5-11 cm, acute-cordate. Spathe 15-25 cm long.

South W. India, Sri Lanka. Locally abundant along streams in upper Ghats. Mostly flowering before monsoon but occasionally flowering after monsoon. *CJS* 13016, *HFP* 76. (Plate 12).

Note: Fischer (in Gamble, *Fl. Madras* 1889[1307]. 1936) separated *L. toxicaria* from *L. ovata* by emphasizing the smaller size of vegetative parts (like *L. meeboldii*) and the bigger spathe (like *L. ovata*) and the fleshy color inside the spathe. All three taxa may only represent variations within a species.

PISTIA Linnaeus

Floating, stoloniferous, rosulate, evergreen herbs. Leaves obovate, pubescent; venation flabellate. Spathe whitish, sessile, less than 1 cm long. Spadix less than 1 cm long with a single pistil adnate to the spathe and a few stamens gathered into a synandrium. Ovules many, basal-subparietal. Seeds oblong.

Pistia stratiotes L., Sp. Pl. 963. 1753; Gamble, Fl. Madras 1573(1097). 1931.

Pantropics. Common in tanks across plains. Flowers in hot season but occasionally throughout the year. *CJS* 11083, 13429.

POTHOS Linnaeus

Suffrutescent, evergreen, root climbers. Spathe persistent. Flowers bisexual, with 6 tepals. Ovary 3-locular; ovules axile, 1 per locule. Berry red; seeds stony, oblong.

Pothos scandens L., Sp. Pl. 968. 1753; Gamble, Fl. Madras 1592(1110). 1931.

Leaves lanceolate with alate petioles; venation palmate. Peduncle to 0.5 cm long. Spathe 0.5 cm. Spadix globose, on a deflexed stipe, 0.5 cm long.

Madagascar, Indomalaysia. Common across Ghats. All seasons. *CJS* 13396, 15268.

REMUSATIA Schott

Cormous, deciduous, usually epiphytic herbs. Leaf ovate, peltate, with reticulate venation and descendant, collective veins between and parallel to the primary veins. Spathe in two parts: lower green and persistent, upper yellow and ovate, soon withering. Spadix divided in 3 parts: lower pistillate, middles terile, upper staminate. Ovules few, anatropous, parietal. Seeds reported ovoid.

Remustia vivipara (Roxb.) Schott in Schott & Endl., Melet. Bot. 18. 1832; Gamble, Fl. Madras 1583(1104). 1931. *Arum viviparum* Roxb., Hort. Beng. 65. 1814 (‘*viviparium*’); Wight, Ic. t. 798. 1844. *Caladium viviparum* (Roxb.) Loddiges, Bot. Cab. t. 281. 1820.

Bulbils produced on erect, coppery shoots. Peduncle to 13 cm. Spathe to 13 cm, yellow above. Spadix 4.5 cm.

India, S. E. Asia to Java. Common in middle to upper Ghats and western plains. Rarely flowering in January without leaves, in July with leaf; ripe berries not seen. *CJS* 17958, *HFP* 1385. (Plate 13).

Note: This species is distinctive for producing bulbils on special shoots. The rareness of inflorescences (fruiting also never observed in Java) suggests this taxon may be surviving with little, if any, sexual reproduction. Study for chromosomal irregularities is suggested.

RHAPHIDOPHORA Hasskarl

Heavy, evergreen, root climbers. Leaves ovate, commonly lobed; venation pinnate. Spathe deciduous, full of spicular trichosclereids. Spadix covered by naked, bisexual flowers. Stamens free, with flat filaments. Ovary 1, incompletely 2-locular; ovules few, basal and parietal. Berries becoming aggregated, the stylar portion sluffing off.

Rhaphidophora laciniata (N. Burman) Merrill, Philipp. J. Sci. 19: 342. 1921; Steenis, Blumea 13: 169. 1965. *Polypodium laciniatum* N. Burman, Fl. Ind. 231. 1768. *Pothos pertusus* Roxb., Fl. Ind. 1: 455. 1820; Wight, Ic. t. 781. 1844. *Rhaphidophora pertusa* (Roxb.) Schott, Bonplandia 5: 45. 1857; Gamble, Fl. Madras 1590(1109). 1931.

Peduncle 4-5 cm long. Spadix 7-11 cm. Stigma punctate. Ovules to 8.

South W. India, Sri Lanka. Frequent in middle & upper Ghats. Apparently flowering during or after the monsoon; fruits ripening during hot season. *CJS* 15954, *HFP* 118.

Note: Roxburgh cited *Elattadi-Maravara* Rheede (*Hort. Malab.* 12: 41, t. 20 & 21). The same plates are the basis of Burman's binomial, *Polypodium laciniatum*, a name omitted by Index Kewensis. The priorable epithet takes precedence.

SAUROMATUM Schott

Cormous, deciduous herbs. Leaf solitary, palmately deeply 7-9-lobed, venation reticulate. Spathe shortly peduncled, entirely withering but with margins connate in tube below and opening into long, narrow blade. Spadix elongate, divided into 5 parts: pistillate, sterile area with clavate pistillodes, naked interstice, staminate portion, and elongate, naked appendix. Stamens free, not grouped into flowers. Ovules 1-2, basal. Seeds not seen.

Sauromatum pedatum (Willd.) Schott in Schott & Endl., Melet. Bot. 17. 1832. *Arum pedatum* Willd., Enum. Suppl. 54. 1809. *Arum guttatum* Wall., Pl. As. Rar. 2: 10, t. 115. 1830. *Arum sessiliflorum*

Roxb., Fl. Ind. 3: 507. 1832; Wight, Ic. t. 800. 1844. *Sauromatum guttatum* (Wall.) Schott in Schott & Endl., Melet. Bot. 17. 1832; Cooke, Fl. Bombay 2: 824. (3: 335). 1908.

N. W. India. Locally abundant in western plains (Harihalli). Flowering in early monsoon (May-June). *HFP* 736.

Note: Species overlooked by Gamble.

149. LEMNACEAE

K. N. Gandhi

Aquatic, floating, monoecious, highly reduced thalloid plants; rootlets 0-few. Thalli free or connected by hyaline ventral stipes, flat or turgid, of various shapes, green, often purple beneath, with 1-2 bud-producing pouches; veins 0-many, radiating from the center of the thallus. Propagation usually by budding or hibernating bulbils, rarely by seeds. Inflorescence consisting of minute 1-2 lower staminate flowers and 1 upper pistillate flower, from a pouch or dorsal cavity, naked or enclosed in a hyaline spathe. Perianth absent. Staminate flower with a single stamen; anther 1-2-celled. Ovary globular, 1-locular; ovules 1-4, basal; style short; stigma truncate or funnel-shaped. Fruit a 1-4-seeded, flask-shaped utricle.

Note: Flowering specimens have not been observed in the district.

1 Rootlets present. Budding pouches 2. Thalli small, about 1 cm across..**Spirodela**
1 Rootlets absent. Budding pouch 1. Thalli minute, less than 1 mm across....**Wolffia**

SPIRODELA Schleiden

Rootlets 2-few; thalli nearly orbicular, about 1 cm across, flat on both sides, each with a dorsal and a ventral scale, and 2 basal budding pouches, one on either side of the axis, green above, purple beneath, few-many-veined; stipes conspicuous. Inflorescence from a budding pouch, enclosed in a spathe. Staminate flowers 2; anthers 2-celled, 4-locellate, dehiscing transversely. Ovary 2-ovuled. Utricle winged on the margin, 1-2-seeded.

Spirodela polyrhiza (L.) Schleiden, Linnaea 13: 392. 1839; Hartog & Plas, Blumea 18: 360. 1970. *Lemna polyrhiza* L., Sp. Pl. 970. 1753; Gamble, Fl. Madras 1593(1111). 1931. *Lemna maxima* Blatter & Hallb., J. Indian Bot. 2: 49. 1921. *Spirodela maxima* (Blatter & Hallb.) McCann, J. Bombay Nat. Hist. Soc. 43: 158. 1942.

Thalli with 6 or more rootlets and 7-15 nerves.

Worldwide. Occasional in small tanks of the plains (Channarayapatna).

Notes: Synonymy is according to Hartog & Plas (*l.c.*). They also recognize *S. punctata* (G. Meyer) Thompson (including *Lemna oligorrhiza* Kurz).

The genus *Lemna* is expected and may be differentiated from *Spirodela* by its solitary rootlet, 1-3 inconspicuous nerves and lack of dorsal and ventral scales.

WOLFFIA Horkel ex Schleiden *nom. cons.*

Thalli without any rootlets or veins, minute, resembling green granules, globular or ellipsoid, with a single, lateral, funnel-shaped budding pouch with a circular opening; stipes joining thalli not conspicuous. Inflorescence from a dorsal cavity (not from the budding pouch), naked. Staminate flower 1; anther 1-celled, 2-locellate, dehiscing apically. Ovary 1-ovulate. Utricle smooth, 1-seeded.

Note: S. C. Maheswari (*Phytomorphology* 4: 355-365. 1956) indicates that the anther is 2-celled, 4-locellate.

Wolffia arrhiza (L.) Horkel ex Wimmer, Fl. Schles. ed. 3, 140. 1857; Gamble, Fl. Madras 1593(1111). 1931; Hartog & Plas. Blumea 18: 367. 1970. *Lemma arrhiza* L., Mant. Alt. 294. 1771.

Thalli ellipsoid, less than 1 mm across, slightly convex on the upper surface.

Worldwide. Locally common in still water at Bagi. *HFP* 2885.

Note: Hartog and Plas (*l.c.*) recognize *W. globosa* (Roxb.) Hartog & Plas and *W. microscopica* (Griff.) Kurz but without defining them or their differences from *W. arrhiza*.

150. PONTEDERIACEAE

T. P. Ramamoorthy

MONOCHORIA Presl

Perennial erect herbs. Leaves solitary, lanceolate-ovate, subtending inflorescence. Inflorescence racemose with older flowers above. Flowers regular, bisexual. Tepals 6, free, petaloid. Stamens 6; anthers basifixed. Ovary superior, 3-locular; ovules many, axillary; style 1, filiform, flattened; stigmas small, capitate. Fruit a loculicidal explosive capsule, with many, ribbed seeds.

Monochoria vaginalis (N. Burman) Presl, Reliq. Haenk. 1: 128. 1827; Gamble, Fl. Madras 1529(1068). 1931; Backer in Steenis, Fl. Malesiana ser. 1, 4: 256. 1951. *Pontederia vaginalis* N. Burman, Fl. Ind. 80. 1768. *Pontederia plantaginea* Roxb., Fl. Ind. 2: 123. 1832. *Pontederia vaginalis* var. *plantaginea* (Roxb.) Solms in A. & C.

DC., Monogr. Phan. 4: 524. 1883; Gamble, Fl. Madras 1529(1068). 1931.

Leaves 5×2-4.5 cm. Stem and petiole to 20 cm. Perianth blue. One stamen larger than others.

Paleotropics. Common in ditches and along margins of large tanks of plains. July-November. *CJS* 13807, *HFP* 2177.

Note: *Eichhornia crassipes* (Mart.) Solms, a floating aquatic with united perianth, 3 large, hairy stamens is an aggressive, introduced Neotropic weed. Although it is widespread in the waterways of the Tropics, and in tanks outside Hassan District, it has not been seen in the District.

151. LILIACEAE

K. N. Gandhi

Usually herbaceous perennials, sometimes climbing; rootstock a rhizome, bulb, corm or tuber with fibrous to fleshy roots. Leaves simple, alternate, radical or scattered, rarely minute, or tendriliferous. Inflorescence scapose, axillary or terminal, racemose or umbellate, bracteate, rarely reduced to a solitary flower. Flowers bisexual, regular, often with jointed pedicels. Perianth 6-merous, in 2 whorls, free or connate, petaloid. Stamens 6, free, often inserted on perianth lobes. Ovary inferior or superior, 3, rarely 1-locular; ovules 1-many per locule; styles 1-3, filiform. Fruit a capsule, sometimes indehiscent or a berry; seeds 1-4 in a locule.

Note: Following Cronquist we have united Amaryllidaceae and Liliaceae.

1 Plant woody. Leaves reduced to spinescent scales with needle-like cladodes..... .....**Asparagus**

1 Plant herbaceous. Leaves not reduced.

2 Leaves ending in tendrils; perianth segments strongly undulate.....**Gloriosa**

2 Leaves without tendrils; perianth segments not undulate.

3 Inflorescence umbellate.....**Crinum**

3 Inflorescence racemose or flowers solitary.

4 Ovary inferior; fruit berry-like (capsular in *Hypoxis*).

5 Plants with rhizomatous creeping rootstock; flowers white or green to purple.

6 Flowers green to purple. Filaments united into a ring closing mouth of perianth. Leaves plicately folded.....**Peliosanthes**

6 Flowers white. Filaments free, short. Leaves flat, not folded....**Ophiopogon**

5 Plants with cormous or tuberous, erect rootstock; flowers yellow.

7 Leaves plicate; plants tomentose. Perianth borne at tip of stipe from ovary hidden in leaf-bases.....**Curculigo**

7 Leaves flat; plants glabrous, perianth attached directly to top of exposed ovary .....**Hypoxis**

4 Ovary superior; fruit a capsule.

8 Rootstock short, with fascicled fleshy roots.....**Chlorophytum**

8 Rootstock a bulb, corm, or rhizome.

9 Leaves fleshy, spiny at margin; flowers red.....**Aloe**
9 Leaves not fleshy and spiny or absent; flowers not red.
10 Flowers appearing before the leaves.....**Urginea**
10 Flowers appearing with the leaves.
11 Leaves radical; flowers many.....**Scilla**
11 Leaves cauline; flowers 1-2 per axis.....**Iphigenia**

ALOE Linnaeus

Rootstock rhizomatous. Leaves fleshy, usually radical and spiny. Inflorescence racemose. Perianth segments connate. Stamens equaling perianth. Ovary superior; ovules many; style 1. Fruit a capsule.

Aloe vera (L.) N. Burman, Fl. Ind. 83. 1768; Gamble, Fl. Madras 1520(1062). 1928. *Aloe perfoliata* var. *vera* L., Sp. Pl. 320. 1753.

Stem subterranean. Leaves spiny, 30×4 cm. Pedicel shorter than bracts; perianth red, segments equaling tube.

Native of Canaries. Possibly weakly naturalizing in one area of plains (near Belvathalli). July-January. *CJS* 14145.

ASPARAGUS Linnaeus

Woody climbers, usually armed; rootstock with fascicled, tuberous roots; stem branching, smooth, terete, woody; branches angular. Leaves reduced to recurved spinescent scales; foliar cladodes arising in the axils of scale-leaves, crowded, 2-6-nate, flattened or subterete. Flowers solitary, clustered, umbelled or racemose, axillary with scarious, keeled bracts. Flowers white, small, with jointed pedicels. Ovary superior, 3-locular but 2 aborting; style short; stigmas 3. Fruit a subglobose, berry with 1-6 smooth black seeds.

1 Cladodes more than 1 mm wide, flattened.....*A. gonoclados*
1 Cladodes less than 0.6 mm wide, subterete.....*A. racemosus*

Asparagus gonoclados Baker, J. Linn. Soc. Bot. 14: 627. 1875; Gamble, Fl. Madras 1517(1060). 1928.

Cladodes flat, stout, acute or acuminate, falcate. Spines shorter (0.4 cm). Flowers in raceme.

Tropical India. Common in upper Ghats and western plains. August-January. *HFP* 652, 1567. Sometimes cultivated as ornamental.

Asparagus racemosus Willd., Sp. Pl. 2: 152. 1799; Wight, Ic. t. 2056. 1853; Gamble, Fl. Madras 1517(1060). 1928.

1 Raceme terminated by flowers.....var. *racemosus*
1 Raceme terminated by cladodes.....var. *javanicus*

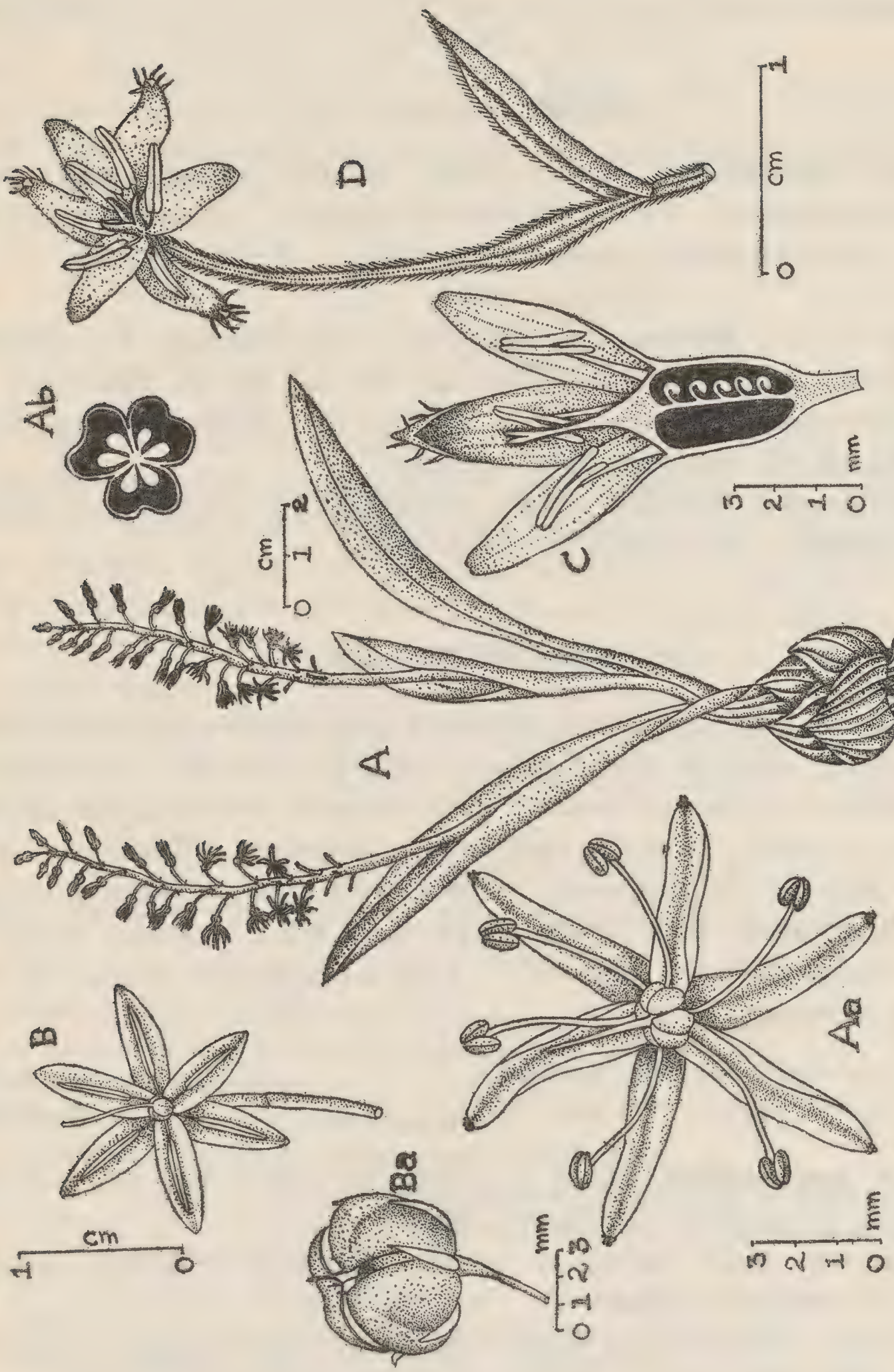


Fig. 118. LILIACEAE. *A. Scilla hyacinthina*: habit, *Aa*, flower; *Ab*, section of ovary. *B. Chlorophytum arundinaceum*: flower; *Ba*, fruit. *C. Hypoxis aurea*: section of flower. *D. Curculigo orchioides*: flower.

var. **racemosus**

Cladodes slightly compressed, triquetrous, acuminate, falcate. Spines longer (0.6 cm), decurved.

Paleotropics. Common in partial shade on thin soil of plains (Byra, Hassan) and across upper Ghats. August-January. *CJS* 15660, *HFP* 1717.

var. **javanicus** (Kunth) Baker, J. Linn. Soc., Bot. 14: 624. 1875; Sant., Fl. Khandala ed. 3, 282. 1967. *Asparagopsis javanica* Kunth, Enum. 5: 100. 1850.

Cladodes much more slender than in *A. racemosus,* flexuous.

Tropical India, Java. Common amongst *Phoenix* clumps on plains (Byra, Balupet). July-August. *HFP* 1817.

CHLOROPHYTUM Ker-Gawler

Perennial, scapigerous herbs; roots often tuberous, fascicled on a short rootstock. Leaves radical, entire, linear to oblong-lanceolate, acute, acuminate, sometimes falcate at apex, sheathing at base. Inflorescence a raceme, as long as or longer than leaves. Flowers with jointed pedicels. Tepals white, 3-5-nerved. Ovary superior. Fruit a sharply trigonous, 3-valved, many-seeded capsule.

1 Raceme with flowers close (less than 1 cm apart). Leaves spiralled . . . . . *C. arundinaceum*
1 Raceme with flowers scattered (more than 1 cm apart). Leaves 2-ranked . . . . *C. laxum*

Chlorophytum arundinaceum Baker, J. Linn. Soc., Bot. 15: 323. 1876; Gamble, Fl. Madras 1526(1066). 1928.

Roots tuberous. Leaves radical, oblong-lanceolate, acuminate, narrowed into a petiole, to 80×2 cm. Scape to 1 m, often branching at apex, with scarious bracts. Pedicels jointed above the middle. Perianth white. Anthers longer than glabrous filaments.

Tropical India, Burma. Locally common on hill tops (Nagpuri, Bageshpur). June-January. *HFP* 1939, 2818.

Chlorophytum laxum R. Br., Prodr. 277. 1810; Gamble, Fl. Madras 1526(1066). 1928. *Chlorophytum parviflorum* Dalzell, Hooker's J. Bot. Kew Gard. Misc. 2: 141. 1850. *Phalangium parviflorum* (Dalzell) Wight, Ic. t. 2039. 1853.

Leaves 2-ranked, recurved, linear-lanceolate, acute, acuminate, 8-16×0.3-0.5 cm. Scape slender, flexuous, 10-15 cm long. Flowers scattered on the scape with jointed pedicels. Staminal filaments glabrous, longer than the anther.

Paleotropics. Common on the open grassy slopes across plains and upper

Ghats (Hebbsale), sometimes on soil collected on clefts of tree trunks. May-October. *HFP* 1724, 1814.

Notes: *C. malabaricum* Baker with anthers shorter than ribbon-like filaments and pedicels jointed at or above middle has been collected in Bababudan Hills (Chickmagalur District) bordering Hassan.

C. tuberosum Baker with cylindric, tuber-like roots, anthers equaling filaments, and floral pedicels jointed at or below middle can be expected in the Hassan District.

CRINUM Linnaeus

Bulbous undershrubs. Leaves radical, ensiform, thick, fleshy, sometimes channeled, with smooth or scabrid margins. Inflorescence an umbel subtended by 2 spathaceous bracts with linear bracteoles. Flowers subsessile. Perianth salverform, tubular, cleft into 6 linear-lanceolate, white to pinkish, reflexed lobes. Staminal filaments filiform, spreading, equaling perianth lobes, with anthers curved, 1-2 cm long. Ovary inferior, few-to-many-ovuled; style filiform; stigma minute. Fruit subglobose, 3-4 cm across, few-seeded, breaking up irregularly.

1 Leaves flat, 7-15 cm broad.....*C. asiaticum*
1 Leaves channeled, 3-5 cm broad.....*C. defixum*

Crinum asiaticum L., Sp. Pl. 292. 1753; Gamble, Fl. Madras 1504 (1051). 1928.

Leaves flat, obtuse, 60-90 × 7-15 cm, with smooth or scabrid margin. Flowers 10-15 in the umbel. Perianth tube 12-15 cm long; lobes 6-9 cm long.

Tropical India, Sri Lanka, Java. Common in shade or full sun, on moist or dry soil across plains and hills. March-April in hills, July-August on the plains. *HFP* 1803, 2115.

Crinum defixum Ker-Gawler, J. Sci. Arts (London) 3: 105. 1817; Gamble, Fl. Madras 1504 (1051). 1928.

Leaves channeled, obtuse or acute, 30-60 × 3-6 cm with distantly, obscurely scabrid margin. Flowers 7-12. Perianth tube 10-13 cm long; lobes to 8 cm.

India, Sri Lanka. Frequent along rivers across District. September-November. *HFP* 2078, 2467.

CURCULIGO Gaertner

Tuberous, slender herbs. Leaves radical, entire, oblong-lanceolate, plicate, acuminate, pilose, sheathing at base. Flowers solitary on a short scape. Perianth segments petaloid, spreading, borne on a long, narrow

stipe (rostrum). Ovary inferior, hidden amongst leaf bases; style filiform; stigmas 3. Fruit berry-like.

Curculigo orchioides Gaertner, Fruct. 1: 63, t. 16. 1788; Gamble, Fl. Madras 1502 (1050). 1928. *Curculigo malabarica* Wight, Ic. t. 2043A. 1853.

Tuber elongated, tip crowned with the remains of old leaves. Leaves 8-12 × 1-1.6 cm, subsessile or petioled. Ovary hairy without, crown produced into a hairy stipe (3.5 cm long) bearing the spreading, yellow, hairy perianth lobes. Anthers basifixed, longer than filaments.

India, Java. Common in the exposed grasslands of plains and upper Ghats. May-September. *HFP* 1767, 1804.

GLORIOSA Linnaeus

Herbaceous climber with fascicled, tuberous roots. Leaves subsessile, cauline, alternate (sometimes opposite on same stem), simple, ending in tendril. Flowers solitary, axillary. Perianth segments free, red and orange, undulate. Stamens spreading, equaling perianth segments, with dorsifixed anthers. Ovary superior; style long, trifid, bent at base at right angle to ovary axis. Fruit a loculicidal, many-seeded capsule.

Gloriosa superba L., Sp. Pl. 305. 1753; Wight, Ic. t. 2047. 1853; Gamble, Fl. Madras 1519 (1061). 1928.

Climbing to 4-6 m. Leaves oblong to ovate-lanceolate, 5-10 × 1-5 cm. Pedicels 6-8 cm, reflexed at the tip. Stigma introrse. Capsule green, smooth, oblong.

Paleotropics. Fairly common in upper Ghats, plains and hills. August-September. *CJS* 11424, *HFP* 613.

HYPOXIS Linnaeus

Small herbs with a cormous rootstock. Leaves radical, spreading, reflexed, simple, linear, acute. Flowers solitary or racemose, the scape slender, hairy above. Perianth lobes petaloid, hairy without. Ovary inferior, elongate, hairy. Fruit a capsule.

Hypoxis aurea Lour., Fl. Cochinch. 200. 1790; Gamble, Fl. Madras 1501(1049). 1928.

Slender herbs with corm 1 cm long, crowned with remains of old leaves, the root fibers fleshy. Leaves 8-17 × 0.2-0.4 cm, glabrous or hairy. Scape 5-10 cm long. Perianth lobes sessile on the top of ovary, elliptic, lanceolate, acuminate, yellow. Capsule green.

India, S. E. Asia. Fairly common on grassy soil across upper Ghats. May-August. *CJS* 14779, *HFP* 2021.

IPHIGENIA Kunth

Cormous, small, grass-like herbs. Leaves alternate, more or less 2-ranked, sessile, sheathing at base. Flowers 1-2, axillary and/or terminal, leafy-bracted, short- or long-pedicelled. Perianth lobes free. Ovary superior, many-ovuled; styles 3, shortly united below. Fruit a many-seeded capsule.

1 Flowers long-pedicelled (2-5 cm), chocolate brown.
2 Leaves acicular, perianth filiform.....*I. mysorensis*
2 Leaves not acicular; perianth elliptic-linear.....*I. indica*
1 Flowers short-pedicelled (0.5-1 cm), white or with purple spots.....*I. pallida*

Iphigenia indica (L.) A. Gray in Kunth, Enum. 4: 213. 1843; Gamble, Fl. Madras 1528(1067). 1928. *Melanthium indicum* L., Mant. Alt. 226. 1771.

Stem slender, 10-15 cm. Leaves dense, linear-lanceolate, acuminate, sessile, the lower longer, 10-16 × 0.2 cm. Pedicels 2-5 cm long. Perianth segments linear, subulate, reflexed, chocolate brown. Stamens dark purple; filaments flattened. Ovary green. Capsule oblong or sub-globose.

Indomalaysia. Fairly common in partial shade on grassy soil of upper Ghats, plains and hills. August-September. *HFP* 546, 2017.

Note: Backer & Bakh. f. (*Fl. Java* 3: 85. 1968) state that the corm normally dies, once the flowering and fruiting cycle is complete.

Iphigenia mysorensis Arekal & Swamy, Bot. Not. 125: 220. 1972.

Internodes longer; leaves acicular; petals filiform, fruits obovoid, smaller.

Karnataka. Eastern plain (Boovanahalli, Mavinkere).

Note: The three species listed here are closely related. Biosystematic studies seem to be called for.

Iphigenia pallida Baker, J. Linn. Soc., Bot. 17: 451. 1879; J. Hooker, Fl. Brit. India 6: 357. 1892.

Leaves linear-lanceolate, acuminate; lower longer, 8-12 cm long, 0.1-0.2 cm broad. Pedicels short, 0.5-1 cm. Perianth lobes linear, white or with purple spots. Capsule oblong.

South W. India. Fairly common in full sun on hard soil in hills (Nagpuri, Shigegudda). June-August. *CJS* 14064, *HFP* 1954.

Note: Suggested as a variety of *I. indica* by J. Hooker. Taxon not mentioned by Gamble.

OPHIOPOGON Ker-Gawler

Slender herbs with a short rhizomatous rootstock. Leaves radical, tufted, sessile, sheathing at base. Raceme densely flowered on scape, as long as or shorter than leaves, with scarious bracts. Perianth campanulate, white. Stamens at the base of the perianth segments with short filaments. Ovary inferior; locules 2-ovulate. Fruit berry-like each, seed swelling up from the inferior ovary and appearing superior.

Ophiopogon intermedius D. Don, Prod. Fl. Nepal. 48. 1825; Gamble, Fl. Madras 1499 (1048). 1928. *Ophiopogon indicus* Wight, Ic. t. 2050. 1853.

Leaves linear-lanceolate, acute or acuminate, glabrous, 20-30 cm long, 0.5-1 cm broad; base narrowed into a petiole. Peduncle 10-30 cm long. Raceme 5 cm long.

Tropical India. Common in shade of forest undergrowth, on wet, thin soil of upper Ghats and plains (Bagi, Saklespur). June-August. *CJS* 10040, 14474.

PELIOSANTHES Andrews

Scapigerous herbs with creeping rootstock and fleshy roots. Leaves simple, entire, plicately folded; venation striate. Inflorescence racemose, with scarious, 1-several-flowered bracts. Flowers pedicelled or rarely sessile. Perianth persistent, campanulate to spreading, petaloid, with 6 subequal lobes, connate at base in a short, spreading tube. Staminal filaments short, united into a fleshy ring closing mouth of perianth; anthers small, dorsifixed. Ovary inferior; ovules 2-6 per locule, sub-basal; style conical, with 3 subsessile stigmas. Seeds 1-few, berry-like, bursting out of pericarp and appearing to be superior.

Peliosanthes teta Andrews, Bot. Rep. 605. 1810.

Subsp. **humilis** (Andr.) Jessop in mss. *Peliosanthes humilis* Andr., Bot. Rep. 634. 1811. *Peliosanthes neilgherrensis* Wight, Ic. t. 2052. 1853; Gamble, Fl. Madras 1498 (1047). 1928. *Peliosanthes courtallensis* Wight, Ic. t. 2051. 1853; Gamble, Fl. Madras 1498 (1047). 1928.

Petiole equaling blade; blades elliptic, 20-30 × 4.7 cm, acute-acuminate at apex, acute-cuneate at base, membranous; venation of 7-9 subequal, striate primary veins with 3-5 secondaries parallel between primaries and transverse tertiaries. Raceme basal, up to 6 cm long, with scarious, 1-flowered, 3 × 7 mm, elongate-triangular bracts. Flowers many, dense, purplish-green, 1 cm across, on stipes up to 5 mm long. Anthers white. Ovary with 4, sub-basal ovules per locule. Pseudoberries green, turning dark blue to purple, 1.5 × 1.0 cm.

Indo-Malaya. Locally abundant in deep shade of slopes near streams in upper Ghats. Flowering November-January. *HFP* 935, 1304.

Note: J. P. Jessop has revised the genus *Peliosanthes* Andr. for the *Flora Malesiana* and annotated the sheets at the British Museum and at Kew. He recognizes only one species *P. teta* Andr. with 2 subspecies—subsp. *teta* and subsp. *humilis*. It would appear that Jessop considers leaf-venation, length of inflorescence and flower color to be of minor taxonomic value. The typical subspecies has many flowers to a bract while the subspecies *humilis* has a solitary flower to each bract.

SCILLA Linnaeus

Bulbous, slender herbs. Leaves radical, obovate; base narrowed into a petiole. Inflorescence of 1-3, many-flowered racemes with minute bracts. Perianth segments green to purple. Staminal filaments free, glabrous, longer than anthers. Ovary superior, shortly stalked; ovules 1-several per locule. Fruit a subglobose capsule.

Scilla hyacinthina (Roth) Macbride, Contr. Gray Herb. 56: 14. 1918; Rau, Bull. Bot. Surv. India 10 (Suppl. 2): 80. 1969. *Ledbouria hyacinthina* Roth, Nov. Pl. Sp. 195. 1821; Wight, Ic. t. 2040. 1853. *Barnardia indica* Wight, Ic. t. 2041. 1853. *Scilla indica* (Wight) Baker, Refug. Bot. 3: 12. 1870; Gamble, Fl. Madras 1527(1067). 1928, non Roxb., 1832.

Bulbs tunicate, 2-3 cm across. Leaves 10 cm long, 2-3 cm broad. Scape as long as or longer than leaves. Racemes 4-6 cm long. Pedicels short, 0.2-0.5 cm long.

Ethiopia and Indian region. Fairly common in the plains and hills, often on grassy and hard soil or at bases of rocks. June-July. *CJS* 13764, *HFP* 15.

URGINEA Steinheil

Scapigerous, bulbous herbs. Leaves radical, simple, entire. Inflorescence racemose, often appearing before the leaves, bracteate. Perianth campanulate, 6-segmented. Stamens 6; anthers linear. Ovary superior, sessile; ovules many per locule; stigma capitate. Fruit a triquetrous, loculicidal capsule; seeds many, flat, black.

Urginea indica (Roxb.) Kunth, Enum. 4: 333. 1843; Gamble, Fl. Madras 1527(1066). 1928. *Scilla indica* Roxb., Fl. Ind. 2: 147. 1832.

Bulb globose, 5 cm thick. Leaves linear-lanceolate, ensiform, acute, to 30 × 1 cm, glaucous. Scape to 60 cm, slender. Pedicels 3-4 cm long. Perianth segments linear-oblong, pale brown, white at margin. Staminal filaments white, flattened below; anthers versatile, yellow. Capsule elliptic, 1.5 cm long.

Tropical India. Common in dry areas, usually at bases of bushes and rocks (Nagpuri, Holenarsipur). April-May. *HFP* 1621, 2965.

152. IRIDACEAE

K. N. Gandhi

BELAMCANDA Adanson *nom. cons.*

Perennial, rhizomatous herbs, with fleshy roots. Leaves equitant, ensiform; venation striate. Inflorescence terminal, dichotomously 2-3-forked corymb. The branches with spathiform leaves. Flowers bisexual, regular, 2-bracteate. Perianth tubular at base, segments 6, petaloid. Stamens 3. Ovary inferior, 3-locular; ovules many, axillary; style erect; stigmas 3. Fruit a loculicidal capsule.

Belamcanda chinensis (L.) DC. in Redoute, Lil. 3: t. 121. 1805; Backer & Bakh. f., Fl. Java 3: 149. 1968. *Ixia chinensis* L., Sp. Pl. 36. 1753.

Stem to 1.5 m. Flowers bright red. Pedicels persisting. Capsule rarely developed.

Introduced from China. An escape near coffee estates of upper Shiradi Ghat (Hebbsale) and western plains (Chikkanahalli). September-October. *CJS* 14453, *HFP* 792.

153. AGAVACEAE

K. N. Gandhi

Perennial shrubs, with rhizomatous stem and a shortly ascending caudex, or erect to subscandent. Leaves alternate, in a rosette, aggregated, sometimes scattered, simple, entire or spiny; venation striate. Inflorescence a raceme or a panicle on a long stout scape. Flowers bisexual, regular, shortly pedicelled. Perianth free or connate, 6-lobed or segmented, tubular or campanulate, petaloid. Stamens 6, free. Ovary superior or inferior, 3-locular; ovules 1-many, axile or basal; style 1 with 1-3 stigmas. Fruit a capsule or a berry, few-many-seeded.

1 Leaves armed, at least with terminal thorn; peduncle more than 4 m. Ovary inferior.
2 Flowers large, over 10 cm long; tepals erect, much exceeded by stamens and style ..... **Agave**
2 Flowers smaller, less than 6 cm long; tepals spreading, longer than stamens and style ..... **Furcraea**
1 Leaves unarmed; peduncle less than 1 m. Ovary superior.
3 Leaves petiolate. Stem erect ..... **Dracaena**
3 Leaves not petiolate. Stem creeping ..... **Sansevieria**

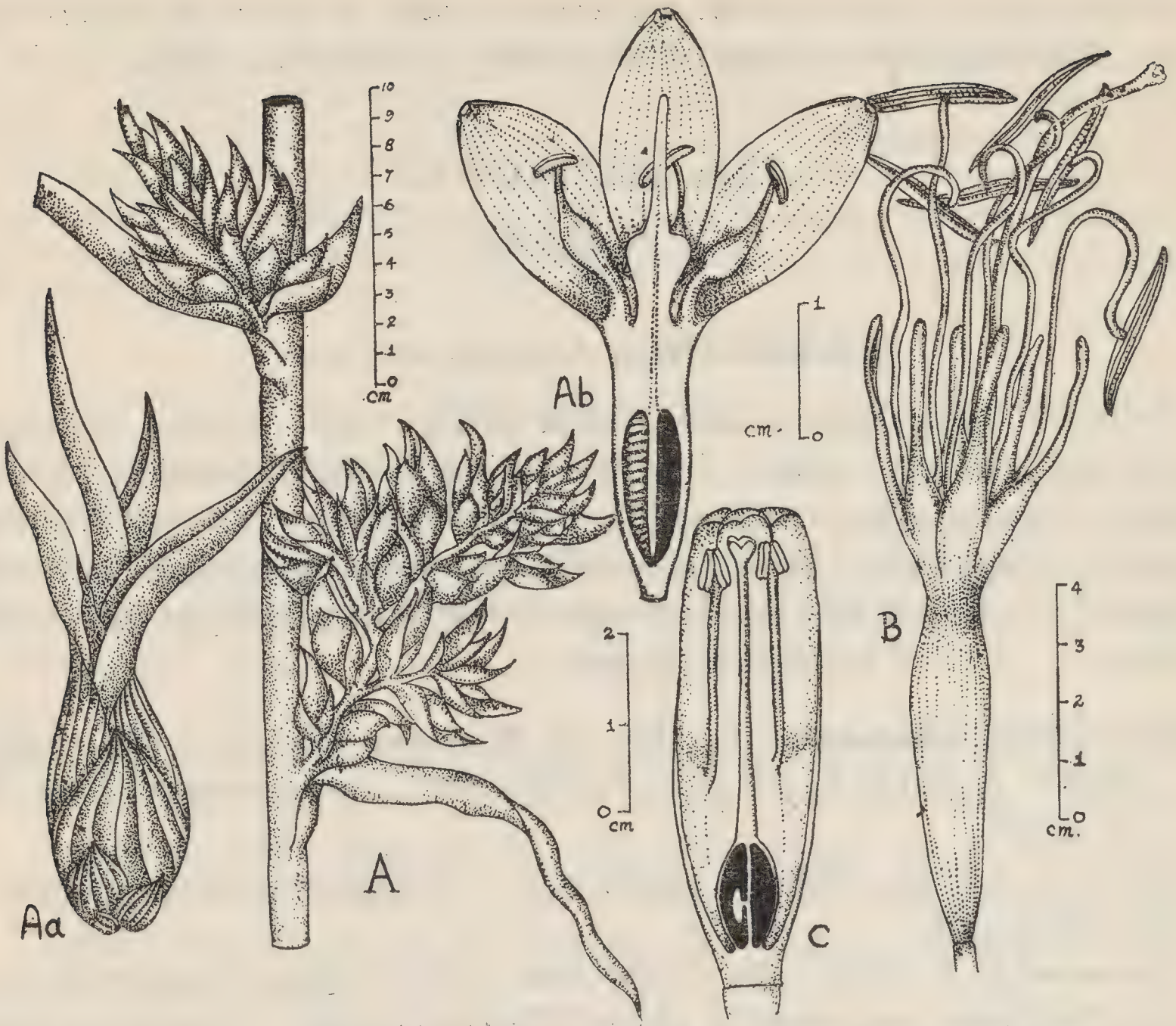


Fig. 119. AGAVACEAE. *A. Furcraea foetida*: inflorescence with bulbils; *Aa*, a bulbil; *Ab*, section of flower. *B. Agave sisalana*: flower. *C. Dracaena terniflora*: section of flower.

AGAVE Linnaeus

Stem short, thick. Leaves radical, fleshy, usually spiny. Inflorescence large, usually paniculate. Perianth connate at base, segments narrow and erect, shorter than stamens. Staminal filaments filiform, not flattened. Ovary inferior; ovules many, biseriate; style filiform; stigma subcapitate.

Agave sisalana Perrine ex Engelm., Trans. Acad. Sci. St. Louis 3: 314. 1875; Gamble, Fl. Madras 1505(1052). 1928; Backer & Bakh. f., Fl. Java 3: 163. 1968.

Leaves with smallish spines along margin, to 200×16 cm, ashy grey, fleshy. Inflorescence paniculate, 4-6 m tall, to 25 cm thick at base. Perianth white, 2-4 cm long. Stamens 6 cm long. Ovary 3-4 cm long.

Native to Neotropics. Common in upper Ghats and across plains. All seasons. *CJS* 12552, *HFP* 1228. Planted as hedge or for fiber.

Note: *Agave americana* L. with coarse spines can be expected. Santapau (*Fl. Khandala* ed. 3, 280. 1967) reports *A. ingens* Berger as naturalizing on the Deccan plateau.

DRACAENA Vandelli ex Linnaeus

Erect or subscandent, woody plant. Leaves entire, petiolate. Inflorescence racemose to paniculate. Perianth long-tubular; stamens included. Ovary superior; ovule 1 per locule; style subcapitate. Fruit a berry.

Dracaena terniflora Roxb., Fl. Ind. 2: 159. 1824; Gamble, Fl. Madras 1521(1062). 1928. *Dracaena terminalis* Wight, Ic. t. 2054. 1853.

Stem to 1 cm thick. Petiole broad, 4-8 cm long; leaf blade elliptic-lanceolate, acuminate, to 16-30×4-8 cm, subcoriaceous. Inflorescence racemose or branched only at base. Perianth white.

Indian & S. E. Asian regions. Frequent in shade, amongst forest undergrowth across Ghats. All seaosns. *CJS* 14201, *HFP* 1534.

Note: J. Hooker (*Fl. Brit. India* 6: 329. 1892) distinguishes varieties on the basis of ratio of leaf length to inflorescence length. We find both elongate and short inflorescences and question the value of these subspecific taxa.

J. Hooker (*l.c.* 328) points out the unresolved confusion between *D. spicata* and *D. terniflora*. Our specimens, with flowers distinctly pedicelled and perianth shortly divided, fit *D. terniflora* but it is possible these characters also exist in *D. spicata*. Revisionary work is needed.

FURCRAEA Ventenat

Perianth free, broad, spreading, longer than stamens. Staminal filaments flattened. Style swollen below; stigma inconspicuous.

Furcraea foetida (L.) Haworth, Syn. Pl. Succ. 73. 1812; Backer & Bakh. f., Fl. Java 3: 165. 1968. *Agave foetida* L., Sp. Pl. 323. 1753. *Furcraea gigantea* Vent., Bull. Soc. Philom. Paris 1: 65. 1793; Gamble, Fl. Madras 1505(1052). 1928.

Leaves to 200×18 cm. Perianth to 3.5 cm long. Ovary 1-2 cm long. Floral buds often transformed into bulbils. Fruits not known.

Native to Central America. Common on plains and upper Ghats. July-January. *CJS* 12755, *HFP* 515. Planted as a hedge.

SANSEVIERIA Thunberg *nom. cons.*

Rhizome creeping. Leaves basal, entire, epetiolate. Inflorescence racemose. Perianth narrowly tubular. Ovary superior; ovule 1 per locule; style linear; stigma simple. Pericarp falling away from ripening berry-like seeds.

Sansevieria roxburghiana J. & J. Schultes in Roemer & Schultes, Syst. 7: 357. 1829; Gamble, Fl. Madras 1520(1061). 1928. *Sansevieria zeylanica* Roxb., Pl. Cor. t. 184. 1805, non (L.) Willd., 1799.

Leaves semi-terete, to 1 m long and 5 cm thick, with scattered horizontal black bars above. Racemes to 1 m long.

South W. India & Sri Lanka. Occasional in upper Bisle Ghat (Bannuhalla). Planted as hedges. January-June. *CJS* 16227, *HFP* 2882.

Notes: J. Hooker (*Fl. Brit. India* 6: 270. 1892) does not make the distinction from *S. zeylanica* (L.) Willd. clear. This problem needs study in conjunction with African species.

The ripening of the berry-like seeds outside the pericarp indicates an affinity of *Sansevieria* with the Ophiopogonoid genera of the Liliaceae.

154. SMILACACEAE

K. N. Gandhi

SMILAX Linnaeus

Climbing, shrubs with woody, terete, often prickly stem; branches angular. Leaves simple, entire, alternate, 3-7-ribbed, reticulately nerved; petiole with broad, sometimes tendriliferous sheath. Inflorescence of 1-3 or many umbels on axillary, bracteate peduncles. Flowers dioecious, pedicelled, regular. Perianth 6-merous, free, petaloid. Stamens 6, free. Pistillode 0. Staminodes usually 3 in pistillate flowers. Ovary superior, 3-locular; ovules pendulous, 1-2 per locule. Stigmas sessile, 3, recurved. Fruit a globose berry with 1-2 hemispherical seeds.

1 Umbels many on an axillary peduncle; petiole-sheath auricled.....*S. perfoliata*
1 Umbels 1-3 per inflorescence; petiole-sheath not auricled, inconspicuous..*S. zeylanica*

Smilax perfoliata Lour., Fl. Cochinch. 622. 1790; Koyama, Advancing Frontiers Pl. Sci. 4: 59. 1966. *Smilax prolifera* Roxb., Fl. Ind. 3: 795. 1832; Gamble, Fl. Madras 1519(1061). 1928.

Climber with few prickles. Leaves elliptic-lanceolate, retuse or shortly apiculate. Petiole conspicuously sheathed to half its length. Umbels many. Flowers white.

Tropical India, S. E. Asia. Fairly common in upper Ghats and western plains (Vattehalla). July to January. *CJS* 9799, 12326.

Note: This taxon seems fairly distinct. However, the multi-umbel condition with large sheath can be found on the same plant with few umbels and inconspicuous sheath (*HFP* 2675). Even Gamble (*l.c.*) indicated that *S. wightii* (supposedly 1-2-umbelled and with inconspicuous sheath) was doubtfully distinct from *S. perfoliata*.

Smilax zeylanica L., Sp. Pl. 1029. 1753; Gamble, Fl. Madras 1518 (1061). 1928; Koyama, Advancing Frontiers Pl. Sci. 4: 50. 1966.

Stem prickly or not. Leaves broadly ovate or elliptic to oblong-lanceolate, broadest at or below the middle, acuminate, rounded at base, to 16×6 cm. Umbels 1-3 on axillary peduncle. Flowers greenish.

India, S. E. Asia to Java. Common in middle and upper Ghats and western plains (Chikkanahalli). November-April. *CJS* 11680, 15095.

Fig. 120. SMILACACEAE. *A. Smilax zeylanica*: flowering branch: *Aa*, staminate flower. *B. Smilax perfoliata*: portion of inflorescence; *Ba*, pistillate flower; *Bb*, ovary in vertical section.

Note: This taxon seems extremely variable not only among collections but on the same plant. We have 25 collections from Hassan. Most leaves are elliptic and less than 10 cm long. However, *HFP* 1151 and 1758 are larger and fall within *S. wightii* in Gamble's key and *S. ovalifolia* in Koyama's key; another specimen, *CJS* 16343, shows some leaves that would key to *S. ovalifolia* and some leaves that would key to *S. zeylanica*. We consider that due to variability in leaf size and leaf shape in Hassan our material represents a single variable species. Further studies of the variability within plants and of the impact of the environment, might clarify the taxonomy of this difficult complex.

155. DIOSCOREACEAE

K. N. Gandhi

DIOSCOREA Linnaeus

Perennial climbers. Root stock tuberous or rhizomatous with tuberous roots. Leaves usually alternate, simple or compound, entire; venation palmate. Petiole twisted at base. Flowers dioecious, subsessile. Staminate flower: perianth 6-cleft; stamens 6, or 3 alternating with 3 staminodes; pistillode fleshy or none. Pistillate flower: perianth similar to male flowers but smaller; staminodes 6, 3 or 0; ovary inferior, 3-locular; ovules 2 per locule; styles 3. Stigma simple or bifid, recurved. Fruit a loculicidal 3-valved capsule.

1 Stem twining to right (clockwise). Capsule pendulous. Seeds winged all around.
2 Leaf base round or acute. Male spikes fascicled from nodes of leafy or leafless stem ..... *D. oppositifolia*
2 Leaf base cordate. Male spikes 1-3-nate on leafless stem..... *D. belophylla*
1 Stem twining to left (counterclockwise). Capsule reflexed. Seeds winged at base only.
3 Leaves simple, cordate, 7-13-nerved..... *D. bulbifera*
3 Leaves 3-5-foliate (rarely simple toward ends of branches) less than 7-nerved.
4 Male spike to 1 cm. Stamens 6. Female flowers in solitary distant spikes. Capsule less than 3 cm long..... *D. hispida*
4 Male spike 3-4 cm. Stamens 3 alternating with 3 staminodes. Female flowers in 2-3-nate racemes on the spike axis. Capsule more than 5 cm long.... *D. pentaphylla*

Dioscorea belophylla Voigt, Hort. Suburb. Calc. 653. 1844; Gamble, Fl. Madras 1512(1056). 1928; Prain and Burkill, Ann. Roy. Bot. Gard. (Calcutta) 14(2): 348, t. 127. 1938.

Stem twining to right. Leaves simple, shallowly cordate, to 10×8 cm, 7-9-ribbed. Petiole nearly as long as the blade. Male spikes 1-3-nate, on special leafless stems. Female spikes from nodes of leafy branches. Capsule pendulous, broader than long. Seeds winged all around.

India. Fairly common in the wet deciduous to semi-evergreen forests. September-January. *CJS* 9995, 12125.

Note: Differs from *D. wallichii* J. Hooker, in which the male inflorescence is densely paniculate in the axils of leaves.

Fig. 121. DIOSCOREACEAE. *A. Dioscorea oppositifolia*: flowering branch of a pistillate plant; *Aa*, staminate flower; *Ab*, seed. *B. Dioscorea pentaphylla*: flowering portion of staminate plant; *Ba*, pistillate flower; *Bb*, seed.

Dioscorea bulbifera L., Sp. Pl. 1033. 1753; Gamble, Fl. Madras 1511(1055). 1928; Wight, Ic. t. 878. 1844; Prain and Burkill, Ann. Roy. Bot. Gard. (Calcutta) 14(1): 188, t. 77. 1936.

Stem twining to left. Bulbils common in leaf axils. Leaves shallowly cordate, to 15×12 cm, to 11-ribbed. Petiole to 8 cm. Male spikes in slender axillary panicles. Perianth lobes linear. Stamens 6. Female spikes 1-3 together, about 35 cm long; staminodes 6. Capsule quadrately oblong. Seeds winged only at base.

India, Sri Lanka. Fairly common in wet deciduous to semi-evergreen forests. September-December. *CJS* 11404, 15045. Often cultivated for edible tubers.

Dioscorea hispida Dennstedt, Schluss. Hort. Ind. Malab. 15. 1818; Gamble, Fl. Madras 1511(1055). 1928; Prain and Burkill, Ann. Roy. Bot. Gard. (Calcutta) 14(1): 188, t. 77. 1936. *Dioscorea daemona* auct. non Roxb.: Wight, Ic. t. 811. 1844.

Stem twining to left, hirsute. Leaves 3-foliate. Leaflets obovate, to 9×5 cm, pubescent; venation subpalmate. Male spikes solitary or clustered on pubescent rachis, short, cylindrical. Stamens 6. "Female flowers in solitary distant spikes" (Gamble, *l.c.*).

South & South East Asia. Occasional in wet deciduous to semi-evergreen forests. September-January. *CJS* 11296, *HFP* 236.

Dioscorea oppositifolia L., Sp. Pl. 1033. 1753; Gamble, Fl. Madras 1512(1056). 1928; Wight, Ic. t. 813. 1844; Prain and Burkill, Ann. Roy. Bot. Gard. (Calcutta) 14(2): 392, t. 139. 1938.

Stem twining to right. Leaves opposite and alternate, very variable in shape, acuminate, acute at base, 5-ribbed. Male spikes brownish pubescent. Stamens 6; pistillodes often represented by glands. Female raceme solitary, from leaf axils. Pistil pubescent. Capsules stipitate, pendulous, broader than long. Seeds orbicular, winged all around.

India, Sri Lanka. Common throughout the District. July-January. *HFP* 236, 446.

Dioscorea pentaphylla L., Sp. Pl. 1032. 1753; Gamble, Fl. Madras 1511(1056). 1928; Wight, Ic. t. 814. 1844; Prain & Burkill, Ann. Roy. Bot. Gard. (Calcutta) 14(1): 160. 1936.

Stem twining to left. Leaves 3-5-foliate (rarely unifoliate at apex). Leaflets digitate, ovate-elliptic, oblique at base, to 10×5 cm. Bulbils sometimes present in the leaf axils. Male spikes in axillary or terminal panicles, 2-3-nate, white-tomentose. Stamens 3, alternating with 3 staminodes. Female racemes 2-3-nate. Pistil hairy outside. Capsule longer than broad. Seeds winged only at base.

Tropical Africa to Malaysia. Common in wet deciduous to semi-evergreen forests. July-January. *CJS* 14449, *HFP* 1870, 2878.

156. BURMANNIACEAE

T. P. Ramamoorthy

BURMANNIA Linnaeus

Annuals. Leaves alternate, linear, entire, reduced to scales or 0. Flowers regular, bisexual, solitary or secund, terminal. Perianth petaloid, of 3 larger lobes and 3 inconspicuous lobes, all united below in 3-winged, persistent tube. Stamens 3, sessile; anthers with transverse dehiscence; connective broad, spurred and crested. Ovary inferior, 3-locular; ovules many, axillary; style 1; stigma shortly 3-lobed. Fruit a many-seeded capsule.

Burmannia coelestis D. Don, Prod. Fl. Nepal. 44. 1825; Gamble, Fl. Madras 1399(979). 1928; Jonker in Steenis, Fl. Malesiana ser. 1, 4: 17. 1948. *Gonyanthes pusilla* Wall. ex Miers, Trans. Linn. Soc. London 18: 537, t. 38, f. 3. 1841. *Burmannia pusilla* (Miers) Thwaites, Enum. 325. 1864; Jonker, Meded. Bot. Mus. Herb. Rijks. Univ. Utrecht 51: 30. 1938; Sant., Fl. Khandala ed. 3, 262. 1967. *Burmannia coelestis* var. *pusilla* (Miers) Trimen, Handb. Fl. Ceylon 4: 138. 1898.

Stem green, slender, to 15 cm. Basal leaves to 3 cm, scale-like or none, cauline leaves reduced. Flowers usually solitary or 2-6. Perianth with wavy, purple wings starting from an acute base, broadening into truncate-rounded top.

Indomalaysia. Fairly common on the exposed hill tops and slopes of middle to upper Ghats. September-November. *CJS* 15313, *HFP* 945.

157. ORCHIDACEAE

Cecil J. Saldanha

Perennial herbs, terrestrial and with or without subterranean tubers, epiphytic or saprophytic. Stem sympodial or monopodial, often swollen into pseudobulbs. Leaves simple, with convergent or divergent veins. Flowers bracteate, bisexual, irregular, usually resupinate. Sepals 3. Petals 3; the laterals similar; median (lip) greatly modified. Pistil and stamens united to form a gynostegium, having an erect column bearing stigmas and 1 or 2 anthers at the tip; column sometimes produced into a

foot, often adnate to lateral sepals forming mentum. Pollen usually combined into 2-8 pollen masses (pollinia) enclosed by an articulated anther cap (*monandreae*). Stigmas 3; 2 often fused and functional; third often modified into a ligule called rostellum. Pollinia sometimes caudate and attached to rostellum. Ovary inferior, usually 1-locular with parietal placentation; ovules many. Fruit a capsule with many, minute seeds.

1 Terrestrial plants or tuberous epiphytes (*Habenaria crinifera*).
2 Pseudobulbs present, generally exposed.
3 Leaf solitary.....**Tainia**
3 Leaves 2-many.
4 Scape elongated, drooping.....**Geodorum**
4 Scape very short, erect.....**Acanthephippium**
2 Pseudobulbs absent or subterranean.
5 Leaves absent.
6 Sepals and petals adnate to more than half their length; fruiting pedicels more than 2 cm long.....**Didymoplexis**
6 Sepals and petals not adnate; fruiting pedicels less than 1 cm long.
7 Lip spurred.....**Epipogium**
7 Lip not spurred.....**Aphyllorchis**
5 Leaves present.
8 Leaves papery, drying pinkish-white.....**Zeuxine**
8 Leaves not papery, drying greenish-brown.
9 Venation divergent.....**Nervilia**
9 Venation convergent.
10 Inflorescence lateral, on separate shoot from leaves.
11 Column with foot.....**Eulophia**
11 Column without foot.....**Cymbidium**
10 Inflorescence terminal, on same shoot as leaves.
12 Spur absent.
13 Median sepal united to lateral petals; bracts spreading.....**Disperis**
13 Median sepal free; bracts deflexed.
14 Leaves on ground; lip not denticulate.....**Liparis**
14 Leaves cauline; lip denticulate.....**Malaxis**
12 Spur present.
15 Spur double.....**Satyrium**
15 Spur single.
16 Stigmatic surfaces confluent (flowers over 3 cm wide).....**Platanthera**
16 Stigmatic surfaces separate (flowers less than 3 cm wide).
17 Stigmatic surfaces stipitate; ovary and capsule spreading (except *H. heyneana*).....**Habenaria**
17 Stigmatic surfaces sessile; ovary and capsule appressed to flowering axis.....**Peristylus**
1 Epiphytic plants, without tubers.
18 Leaves flat, ensiform, distichous.....**Oberonia**
18 Leaves not flat, ensiform.
19 Lip distinctly spurred or saccate.
20 Spur double.....**Diplocentrum**
20 Spur single.

21 Spur laterally flattened.....**Rhynchostylis**
21 Spur not laterally flattened.
22 Flowers terminal.
23 Pseudobulbs absent; spur shortly pointed.....**Thunia**
23 Pseudobulbs present; spur saccate.....**Pholidota**
22 Flowers lateral.
24 Pollinia 4.....**Sarcanthus**
24 Pollinia 2.
25 Midlobe of lip ending in a backwardly pointed knob.....**Schoenorchis**
25 Midlobe of lip not ending in a knob.
26 Spur with calli or septa within.....**Aerides**
26 Spur without calli or septa within.
27 Midlobe of lip transverse on spur.
28 Spur saccate; midlobe at rim of spur, not covering it.....**Gastrochilus**
28 Spur pointed; midlobe halfway down spur, covering it.....**Smithsonia**
27 Midlobe of lip not transverse on spur, with calli at base.....**Vanda**
19 Lip not spurred.
29 Column-foot present.
30 Sepals united, forming tube at least at base.....**Porpax**
30 Sepals not forming tube.
31 Lip with narrow constriction between laterals and midlobe; calli drawn out into antennae.....**Phalaenopsis**
31 Lip without constriction or antennae.
32 Lip short, fleshy, tongue-like.
33 Sepals subequal.
34 Pollinia 4.....**Trias**
34 Pollinia 8.....**Eria**
33 Sepals unequal; laterals much longer than median.....**Bulbophyllum**
32 Lip flat, subpetaloid.
35 Pollinia 8.....**Eria**
35 Pollinia less than 8.
36 Pollinia 2.....**Polystachya**
36 Pollinia 4.
37 Flowers lasting for a day, not resupinate; pseudobulbs conspicuous, subterminal.....**Ephemerantha**
37 Flowers lasting more than a day, resupinate; pseudobulbs absent or basal.....**Dendrobium**
29 Column-foot absent.
38 Leaves terete.....**Luisia**
38 Leaves not terete.
39 Stem elongate.
40 Inflorescence more than 15 cm long; lip not drawn out into a prow....**Cottonia**
40 Inflorescence less than 10 cm long; lip drawn out into a prominent prow.....**Diploprora**
39 Stem not elongate, shortly rhizomatous.
41 Pseudobulbs present, not marked by transverse leaf-scars.....**Coelogyne**
41 Pseudobulbs absent or when present with transverse leaf-scars.
42 Pollinia 4.....**Sirhookera**
42 Pollinia 2.
43 Inflorescence short, erect, terminal.....**Liparis**
43 Inflorescence long, pendulous, lateral.....**Cymbidium**

ACANTHEPHIPPIUM Blume

Terrestrial. Pseudobulbs exposed, covered by sheaths, terminated by 2-8 elliptic-ovate, plicate leaves. Inflorescence lateral; racemes few-flowered. Flowers large, urceolate. Sepals broad, fused to form a large, ventricose tube with recurved tips. Mentum large, saccate. Petals erect, narrow, included. Lip sessile on foot, reflexed, 3-lobed; disc with complex callus. Column short, stout; foot very long, reflexed. Pollinia 8, erect.

Acanthephippium bicolor Lindl., Bot. Reg. 20: t. 1730. 1835; Gamble, Fl. Madras 1426(997). 1928.

Flower 3.5-4 cm. Lateral lobes of lip hatchet-shaped; midlobe short, spatulate; disc 3-keeled. Flower yellow tipped or spotted with red.

South W. India. Rare, in dense shade of bamboos, on steep banks of Jayaparvathi River, Devarunde, upper Ghats. Flowers in May. *HFP* 2877.

AERIDES Loureiro

Epiphytes. Stem elongate, branching. Leaves usually flat, channeled, coriaceous. Inflorescence a panicle of racemes, few-many-flowered. Flowers showy. Sepals and petals similar, spreading; the lateral sepals somewhat decurrent on column foot. Lip 3-lobed, spurred at base; spur with calli on the inside. Anther cap beaked; pollinia 2, globular, 2-partite; caudicle with basal gland.

1 Leaves cylindrical; spur pointing down..... *A. cylindricum*
1 Leaves channeled.
2 Sepals and petals spotted; lateral lobes of lip small; spur pointing back and down ..... *A. maculosum*
2 Sepals and petals not spotted; lateral lobes of lip larger; spur pointing forward.... ..... *A. crispum*

Aerides crispum Lindl., Gen. Sp. Orch. 239. 1833; Gamble, Fl. Madras 1442(1008). 1928; Sant. & Kap., Orch. Bombay 122. 1966. *Aerides lindleyana* Wight, Ic. t. 1677. 1851.

A robust plant. Leaves channeled. Flower with sweet fragrance, white tinged with pink. Midlobe of lip large, triangular, crenulate. Spur pointing forward.

India, Burma, Sri Lanka. Common in upper Ghats. May-August. *CJS* 13577, 14541.

Aerides cylindricum Lindl., Gen. Sp. Orch. 240. 1833; Wight, Ic. t. 1744. 1851; Gamble, Fl. Madras 1442(1008). 1928.

Leaves terete. Flower pinkish white. Spur of lip conical, pointing down.

Western S. India. Occasional in upper Ghats. March-October. *CJS* 12902, *HFP* 1456.

Note: A striking plant in flower, easily mistaken for a *Luisia* sp. in vegetative condition.

Fig. 122. *Aerides maculosum*: *A*, habit; *B*, *C*, flowers; *D*, column with lip; *E*, column and spur; *F*, lip; *G*, operculum; *H*, pollinia.

Aerides maculosum Lindl., Bot. Reg. t. 58. 1845; Gard. Chron. 691. 1845; Gamble, Fl. Madras 1442(1008). 1928; Sant. & Kap., Orch. Bombay 120. 1966. *Saccolabium speciosum* Wight, Ic. t. 1674-75. 1851.

Leaves channeled. Sepals and petals spotted. Spur pointing back and down.

South W. India. Common in upper Ghats. June-July. *HFP* 376, 2887.

APHYLLORCHIS Blume

Terrestrial, leafless saprophytes; stem slender, erect, unbranched, with tubular, ochreate sheaths. Inflorescence a few-flowered raceme or subcapitate; flowers small. Sepals subequal, free, erect or spreading; petals similar, smaller; lip nearly sessile, shortly clawed, oblong; column long, without foot. Pollinia oblong or clavate, two, 2-lobed.

Aphyllorchis prainii J. Hooker, Fl. Brit. India 6: 117. 1890; Vajravelu & Rathakrishnan, Bull. Bot. Surv. India 10: 99. 1968.

Flower brownish purple; sepals, and petals linear oblong; lip shorter but broader, entire; claw of lip with 2 triangular acute auricles.

South W. India & Naga Hills in N. E. India. Rare; collected once at Kenchankumri State Forest. In shade, on wet humus. July. *CJS* 14222.

Note: Distinguished from *A. montana* Reichenb. f. by the auricled claw of the lip.

BULBOPHYLLUM Du Petit-Thouars *nom. cons.*

Note: Following J. J. Smith, Holttum and Seidenfadan, the treatment of the genus includes *Cirrhopetalum* Lindl.

Sympodial epiphytes with uninodal pseudobulbs on the rhizome. Leaves 1-2, terminating pseudobulb. Inflorescence umbellate or racemose, on a separate scape from the rhizome. Flowers without mentum. Sepals unequal; petals shorter than lateral sepals. Lip fleshy, sessile or clawed, mobile, entire, sometimes auricled at base, short and spatulate or elongate, recurved or not. Column short. Pollinia 4.

1 Inflorescence umbellate.
 2 Dorsal sepal and petals fimbriate.....*B. fimbriatum*
 2 Dorsal sepal and petals not fimbriate, glabrous.
  3 Lateral sepals adherent, rounded at tip.....*B. fischeri*
  3 Lateral sepals not adherent, long acuminate.....*B. mysorense*
1 Inflorescence racemose.
 4 Lip linear oblong, not recurved, fringed with long hairs on the under surface.....*B. tremulum*
 4 Lip short, spatulate, recurved or not, glabrous.
  5 Rhizome slender; pseudobulb small, wrinkled; petals fimbriate.....*B. proudlockii*
  5 Rhizome stout; pseudobulb large, not wrinkled; petals not fimbriate..*B. neilgherrense*

Bulbophyllum fimbriatum (Lindl.) Reichenb. f. in Walp., Ann. Bot. Syst. 6: 260. 1861; Seidenfaden, Dansk Bot. Arkiv 29: 243. 1973. *Cirrhopetalum fimbriatum* Lindl., Bot. Reg. 1839; Gamble, Fl. Madras 1420(993). 1928.

Leafless when in flower. Flowers green, yellow to purple or chocolate. Lateral sepals more than 4 times the length of dorsal sepal, adherent. Lip short, fleshy, spatulate, recurved.

Western S. India. Common in upper Ghats. January-April. *CJS* 9498, 12889.

Bulbophyllum fischeri Seidenfaden, Dansk Bot. Arkiv 29: 202. 1973. *Cirrhopetalum wightii* Thwaites, Enum. Pl. Zeyl. 229. 1861 (non *Bulbophyllum wightii* Reichenb. f. 1861). *Cirrhopetalum gamblei* J. Hooker, Fl. Brit. Ind. 5: 778. 1890 (April); *l.c.* 6: 190. 1890 (Dec.); Gamble, Fl. Madras 1420(993). 1928. *Cirrhopetalum thomsonii* J. Hooker, Fl. Brit. India 5: 778. 1890 (non *Bulbophyllum thomsonii* J. Hooker, 1890). *Bulbophyllum gamblei* (J. Hooker) J. J. Smith, Bull. Jard. Bot. Buitenzorg ser. 2, 8: 24. 1912 (non Hooker, Hooker's Ic. Pl. 21: t. 2058. 1891). *Cirrhopetalum macraei* auct. non Lindley, 1820: Wight, Ic. t. 1652. 1851. *Bulbophyllum macraei* sensu Reichenb. f. in Walp., Ann. Bot. Syst. 6: 263. 1861, excl. basionym.

Leafy when in flower. Flower with the lateral sepals generally yellowish, sometimes brown. Column white. Lip spatulate, recurved.

South W. India, Sri Lanka. Occasional in the upper Ghats at Vanagur and on trees long the river Jayaparvathi. May. *HFP* 73, 1674.

Bulbophyllum mysorense (Rolfe) J. J. Smith, Bull. Jard. Bot. Buitenzorg ser. 2, 8: 26. 1912; Gamble, Fl. Madras 1418(992). 1928. *Cirrhopetalum mysorense* Rolfe, Bull. Misc. Inform. 39. 1895.

Leafy when in flower. Flowers white, with purple lip. Dorsal sepal more than half the length of lateral sepals. Petals without apical seta.

Karnataka. Fairly common in upper Ghats. July-September. *CJS* 14744, *HFP* 282.

Note: B. albidum (Wt.) J. Hooker is closely allied. Seidenfaden (*op. cit.* pp. 191, 182) reduces Wight's plant to synonymy under *B. acutiflorum* Rich. but considers it to be distinct from Rolfe's species. *B. acutiflorum* is supposed to have the dorsal sepal less than half the length of the laterals and a prominent apical seta on each petal (*ibid.* pp. 158-59). Wight's illustration of *B. albidum* (Ic. t. 1653) does not show the characters attributed to *B. acutiflorum.*

Bulbophyllum neilgherrense Wight, Ic. t. 1650. 1851; Gamble, Fl. Madras 1418(992). 1928.

A robust species with the pseudobulbs measuring upto 4 cm. Flowers brown turning purple; petals very small, almost scaly. Lip red with 2 basal auricles.

South W. India. Fairly common in upper and lower Ghats. January-March. *CJS* 12379, *HFP* 2682.

Bulbophyllum proudlockii (King & Pantling) J. J. Smith, Bull. Jard. Bot. Buitenzorg ser. 2, 8: 27, 1912. *Cirrhopetalum proudlockii* King

& Pantling, J. Asiat. Soc. Bengal 66: 588. 1897; Gamble, Fl. Madras 1421(993). 1928.

A small-flowered species, leafless when in flower, displaying great variability in flower coloration, yellow to start with, turning reddish-brown. Petals moderately fimbriate. Lip straight, spatulate.

South W. India. Fairly common at Hullahalli and Hebbsale in upper Ghats. January-April. *CJS* 16469, *HFP* 1382.

Bulbophyllum tremulum Wight, Ic. t. 1749. 1851; Gamble, Fl. Madras 1418(992). 1928.

Leafy when in flower. A striking species with long, pendulous, mobile hairs along sides of lip.

South W. India. Occasional in upper Ghats near Uchangi and Aglatti. January-June. *HFP* 1328, 1735.

COELOGYNE Lindley

Epiphytes. Rhizome slender, creeping. Pseudobulb conical, ovoid, terminated by 1-2 coriaceous leaves. Inflorescence racemose. Flowers with striking scarious bracts; sepals subequal, free; laterals more or less saccate at base; petals similar, narrower. Lip sessile, erect, usually 3-lobed. Column long, not footed, winged upward, hooded near tip. Pollinia 4, cohering by pairs in a granular mass.

Coelogyne breviscapa Lindl., Folia Orch. 4. 1854; Gamble, Fl. Madras 1430(1000). 1928.

Pseudobulbs 2-leaved. Flowers many, long-pedicelled, white. Lip with 2 yellow ridges.

South W. India. Common in upper Ghats. July-September. *CJS* 11628, 16167.

COTTONIA Wight

Epiphytes with elongate stem and channeled, unequally bilobed leaves. Inflorescence a 2-3-branched panicle with long peduncles. Sepals spreading, broader than petals, free; petals more or less similar to sepals. Lip sessile on column, not spurred, fleshy, indistinctly 3-lobed, with 2 short auricles toward the base; sidelobes inconspicuous; midlobe pandurate, retuse at tip; a disc with a basal hairy callus. Column short, pubescent, not winged. Anther cap oblong, beaked. Pollinia 2, unequally 2-partite; caudicle long, strap-shaped, attached to a minute gland.

Cottonia peduncularis (Lindl.) Reich. f., Cat. Orch. Schiller 52. 1857; Sant. & Kap., Orch. Bombay 222. 1966. *Vanda peduncularis* Lindl., Gen. Sp. Orch. 216. 1833. *Cottonia macrostachya* Wight, Ic. t. 1755.

1851; Gamble, Fl. Madras 1439(1006). 1924.

Flowers pedicellate, at tip of peduncle branches. Sepals and petals brown veined with red. Lip with midlobe dark purple and small, pubescent, yellow side lobes.

South W. India, Sri Lanka. Common, though widely scattered along upper Ghats. A remarkable orchid wherein the lip very much resembles a beetle. March-August. *CJS* 13267, *HFP* 2733.

CYMBIDIUM Swartz

Epiphytic or terrestrial herbs with their pseudobulbs covered by sheaths. Leaves coriaceous, linear-lanceolate. Inflorescence lateral, racemose, few-many-flowered, erect or pendulous; scape at base with sheaths. Flowers long-pedicelled, elongate; bracts various. Sepals and petals subequal, spreading. Lip sessile, more or less 3-lobed; lateral lobes incurving, embracing column, not spurred. Column long, winged, without a foot. Anther 1 or imperfectly 2-celled; pollinia 2, sessile, on a strap-shaped gland.

1 Epiphyte. Leaf bifid into 2 unequal lobes at tip; raceme pendulous.....*C. aloifolium*
1 Terrestrial. Leaf entire, acute at tip; raceme erect.....*C. ensifolium*

Cymbidium aloifolium (L.) Swartz, Nov. Act. Sc. Upsal. 6: 73. 1799; Gamble, Fl. Madras 1436(1004). 1928; Sant. & Kap., Orch. Bombay 206. 1966. *Epidendrum aloifolium* L., Sp. Pl. 1350, 1753.

Sepals, petals lanceolate, acute, purple along center with yellow margin. Lip base yellow, side lobes and column purple. Anther cap yellow.

Indomalaysia, including Indochina. Fairly common in upper Ghats. April-May. *CJS* 10344, 10779.

Cymbidium ensifolium (L.) Swartz, Nov. Act. Sc. Upsal. 6: 77. 1799. *Epidendrum ensifolium* L., Sp. Pl. 90. 1753.

var. **haematodes** (Lindl.) Trimen, Handb. Fl. Ceylon t. 90. 1898. *Cymbidium haematodes* Lindl., Gen. Sp. Orch. 162. 1830.

Sepals similar, yellow with red striae. Petals shorter, yellow with red veins. Lip yellow, speckled with red.

Sri Lanka, now Hassan. Common in dense shade, amongst boulders, along streams (Maranahalli) in middle Shiradi Ghat and along banks of Jayaparvathi River, Devarunde, in upper Ghats. January-April. *CJS* 16934, *HFP* 1412.

Note: There seems to be a good deal of doubt regarding the status of *C. ensifolium, C. cyperifolium, C. haematodes* and *C. sinense.* They are very similar and may prove to be variable forms of one taxon.

Fig. 123. *Cymbidium ensifolium* var. *haematodes*: *A*, habit; *B*, *C*, flowers; *D*, column with lip; *E*, column; *F*, lip, *G*, operculum; *H*, pollinia.

DENDROBIUM Swartz *nom. cons.*

Epiphytes. Stem sympodial with elongate or pseudobulbous shoots. Leaves deciduous, alternating on elongate shoots or terminal on pseudobulbs. Dorsal sepal and lateral petals free, more or less similar; lateral sepals adnate to column-foot to form mentum; lip immobile, contracted or clawed at base, 3-lobed or not (*D. haemoglossum*), with thickenings on the inside; side lobes when present erect, embracing column. Column short, angled or 2-toothed at tip; foot often long. Fertile stamen 1; pollinia 4, without caudicles.

1 Stem short, pseudobulbous.
 2 Midlobe of lip papillose along margin.....*D. mabelae*
 2 Midlobe of lip glabrous along margin.....*D. nanum*
1 Stem elongate, not pseudobulbous.
 3 Flowers at leafy nodes.
  4 Flowers racemose, many, not on tubercles.
   5 Leaves membranous, acute.....*D. heyneanum*
   5 Leaves coriaceous, emarginate.....*D. nutans*
  4 Flowers fascicled on leaf-opposed tubercles.
   6 Leaves linear, to 1 cm broad.....*D. haemoglossum*
   6 Leaves elliptic, to 3 cm broad.....*D. aqueum*
 3 Flowers at leafless nodes.
  7 Flowers racemose.
   8 Flowers to 0.5 cm long.....*D. herbaceum*
   8 Flowers more than 1 cm long.
    9 Midlobe of lip more than twice length of lateral lobes.....*D. barbatulum*
    9 Midlobe of lip less than twice length of lateral lobes.....*D. ovatum*
  7 Flowers fascicled.
   10 Midlobe of lip as broad as long.
    11 Column-foot distinct; lip pubescent.....*D. crepidatum*
    11 Column-foot absent; lip glabrous.....*D. lawianum*
   10 Midlobe of lip twice as long as broad.
    12 Lip convolute, pubescent, with 5 central veins.....*D. macrostachyum*
    12 Lip spreading or arched, with 7 central veins.....*D. heterocarpum*

Dendrobium aqueum Lindl., Bot. Reg. 6: t. 59. 1843; Gamble, Fl. Madras 1417(991). 1928. *Dendrobium album* Wight, Ic. t. 1645. 1851.

Stem leafy when in flower. Flowers 2-3, 2.5 cm, white. Lip as broad as long, sometimes broader, 3-lobed; side-lobes obovate-oblong. Lip pale yellow and deflexed at about middle, just below the triangular acute midlobe.

South W. India. Fairly common in upper Ghats. September-October. *CJS* 10944, *HFP* 741. (Plate 14).

Dendrobium barbatulum Lindl., Gen. Sp. Orch. 84. 1830; Gamble, Fl. Madras 1416(990). 1928; Sant. & Kap., Orch. Bombay 93. 1966.

Flowering shoot leafless. Inflorescence terminal and/or lateral.

Flower 2.5 cm, white-pink. Lip clawed at base, with 2 obliquely ovate-oblong, purple side-lobes and an ovate-oblong, acute midlobe; disc with yellow hairs.

South W. India. Common along upper Ghats. January-March. *CJS* 10307, 12581.

Dendrobium crepidatum Lindl. in Paxton, Fl. Gard. 1: 63, f. 45. 1850-51; J. Hooker, Fl. Brit. India 5: 740. 1890; Sant. & Kap., Orch. Bombay 101. 1966.

Pendulous, leafless when in flower. Flowers 1-few-fascicled, white, with rounded, yellowish, pubescent lip. Foot and mentum present.

S. and N. E. India. Scattered in upper Ghats. Cleistogamy seems to be common, many flowers passing from bud to fruiting stage without blooming. March-April. *CJS* 11633, 16650.

Dendrobium haemoglossum Thwaites, Enum. 429. 1864; Gamble, Fl. Madras 1416(990). 1928.

Pendulous. Leaves present when in flower, linear, coriaceous. Flowers in leaf-opposed pairs, yellow with red bands on lip.

S. India, Sri Lanka. Scattered on upper Ghats. Flowers in October-December; fruits to April. *CJS* 10297, *HFP* 47.

Note: Kranzlin (in Engler, Pflanzenr. 45: 166. 1910) reduces this species to synonymy under *D. bambusifolium* Par. & Reich. f. He also segregates it from *D. salaccense* (Blume) Lindley by the shape and number of keels on the lip. For the present we have retained the name used by Thwaites.

Dendrobium herbaceum Lindl., Bot. Misc. 69. 1840; Gamble, Fl. Madras 1416(990). 1928; Sant. & Kap., Orch. Bombay 82. 1966.

Stem leafless when in flower, grooved. Flowers shortly racemed, about 0.75 cm, white. Lip with obscure side-lobes and a terminal triangular midlobe.

S. & N. E. India. Common in upper Ghats. February-April. *CJS* 11627, *HFP* 1327.

Dendrobium heterocarpum Wall. ex Lindl., Gen. Sp. Orch. 78. 1830; Gamble, Fl. Madras 1416(991). 1928. *Dendrobium aureum* Lindl., Gen. Sp. Orch. 77. 1830; Wight, Ic. t. 1646. 1851.

Usually deciduous when in flower. Flowers to 3.25 cm, yellow with obscurely 3-lobed, orange-red, hairy lip.

Indomalaysia. Occasional in upper Ghats. January-February. *HFP* 1386, 2604.

Dendrobium heyneanum Lindl., Gen. Sp. Orch. 78. 1830; Gamble Fl. Madras 1415(990). 1928; Wight, Ic. t. 909. 1844-45.

Tufted, small, leafy when in flower. Racemes terminal and axillary. Flower 1 cm with a spur-like mentum, white. Lip distinctly 3-lobed; midlobe crenulate, pink and carunculate on disc.

South W. India. Common in upper Ghats (Vanagur, Mankanahalli). July-October. *CJS* 14189, *HFP* 1883.

Dendrobium lawianum Lindl., J. Linn. Soc., Bot. 3: 10. 1859 ('*lawanum*'); Sant. & Kap., Orch. Bombay 102. 1966. *Dendrochilum roseum* Dalzell, Hooker's J. Bot. Kew Gard. Misc. 4: 291, 1852 (non *Dendrobium roseum* Sw. 1805).

Flowers white with tinge of pink. Lip oblong, white, glabrous, similar to sepals. Column without foot.

South W. India. Collected once from upper Ghats. March. *CJS* 16997.

Note: Very near *D. crepidatum* but sufficiently distinct. The absence of the column-foot is an anomaly for a *Dendrobium*.

Dendrobium mabelae Gammie, J. Bombay Nat. Hist. Soc. 16: 567. 1905; Sant. & Kap., Orch. Bombay 89. 1966.

Pseudobulbous, leafy when in flower. Raceme terminal. Flower 0.7 cm, white. Lip narrowed and pinkish at base, obscurely 3-lobed, broadening into a green orbicular apex with two rows of papillose hairs along margin; disc fleshy, bifid, at tip.

South W. India. Scattered in upper Ghats. September-October. *CJS* 14065, *HFP* 1405.

Dendrobium macrostachyum Lindl., Gen. Sp. Orch. 78. 1830; Wight, Ic. t. 1647. 1851; Gamble, Fl. Madras 1416(990). 1928.

Deciduous. Flowers fascicled, lemon to brownish. Lip to 1.7 cm, orange, convolute; midlobe subquadrately oblong, minutely fimbriate, puberulous; disc with 3 narrow ridges and 5 veins.

India, Sri Lanka. Common in upper Ghats. April-May. *CJS* 13325, *HFP* 1628.

Dendrobium nanum J. Hooker, Ic. Pl. t. 19. 1853; Gamble, Fl. Madras 1415(990). 1928.

Pseudobulbous, leafy when in flower. Flower 0.7 cm, white with green lip and column; disc with 3 truncate ridges.

South W. India. Rare along upper Ghats. September-October. *CJS* 14778, *HFP* 928.

Note: Very similar and easily confused with *D. mabelae*. *D. microbulbon* A. Richard belongs to this group and may be found in the District. It has no leaves at flowering time. The lip is pinkish.

Dendrobium nutans Lindl., Gen. Sp. Orch. 90. 1830; Gamble, Fl. Madras 1416(990). 1928. *Dendrobium jerdonianum* Wight, Ic. t. 1644. 1851.

Flower 2.2 cm, orange colored. Lip with 2 lateral rounded side lobes; midlobe linear-lanceolate, acute, crisped; disc 3-ridged along center.

South W. India, Sri Lanka. Common in the upper Ghats. Flowers January-March; fruits to December. *CJS* 17975, *HFP* 1361.

Dendrobium ovatum (Willd.) Kranz. in Engler, Pflanzenr. 45: 71. 1910; Gamble, Fl. Madras 1416(990). 1928; Sant. & Kap., Orch. Bombay 91. 1966. *Cymbidium ovatum* Willd., Sp. Pl. 4: 101. 1805. *Dendrobium barbatulum* auct. non Lindl. 1830: Wight, Ic. t. 910. 1844-46.

Flowers 1.5 cm, greenish-yellow. Midlobe of lip less than twice length of side lobes; disc with tuft of short hairs.

South W. India. Common in the upper Ghats. November-December. *CJS* 10295, *HFP* 2569.

DIDYMOPLEXIS Griffith

Leafless terrestrial herbs, with tuber-like elongate roots. Inflorescence terminal, racemose, few-flowered. Flowers small, pedicelled, bracteate. Dorsal sepal coherent with lateral petals; lateral sepals adherent. Lip shortly clawed, shorter than the calyx, on foot of column, entire; disc with numerous minute granulations. Column erect, winged above. Anther 2-celled, terminal; pollinia 4, in unequal pairs, sessile, granular.

Didymoplexis pallens Griff., Calcutta J. Nat. Hist. 4: 383, t. 17. 1844; Gamble, Fl. Madras 1459(1021). 1928; Sant. & Kap., Orch. Bombay 162. 1966. *Apetalon minutum* Wight, Ic. t. 1758. 1851.

Flowers brown, small. Lip shortly clawed, oblong, truncate at tip; sides incurving at tip; granulations on disc more at base and apex. Pedicel elongating considerably after fertilization.

Indomalaysia. Rare in upper Ghats, along Jayaparvathi River, Devarunde, in shade of *Lantana* and common at lower Shiradi Ghat at Kagenari, on humus of decaying leaves under bamboos. May-June. *CJS* 13737, *HFP* 1795.

DIPLOCENTRUM Lindley

Epiphytes. Stem short; leaves lanceolate, channeled, unequally bilobed at apex. Inflorescence simple or branched racemes. Flowers resupinate. Sepals and petals free; the lateral sepals somewhat larger. Lip sessile on column, basally with 2 spurs, lanceolate, truncate. Column short, 2-auricled, without foot, truncate. Pollinia 2, globular, 2-partite; caudicle broadening into large gland.

Diplocentrum congestum Wight, Ic. t. 1682. 1851; Gamble, Fl. Madras 1449(1013). 1924; Sant. & Kap., Orch. Bombay 236. 1966.

Fig. 124. *Diploprora championi*: *A*, habit; *B*, *C*, flowers; *D*, column with lip; *E*, section of flower; *F*, lateral sepal; *G*, operculum; *H*, pollinia; *I*, stipe with gland.

Flowers waxy pink. Lip fleshy; spurs slightly divergent, disc naked.

South W. India. Common on roadside trees in upper Ghat (Hettur). May-July. *CJS* 13578, 13861.

DIPLOPRORA J. D. Hooker

Epiphyte; stem short, slender, with articulate, falcately lanceolate leaves. Inflorescence lateral, bursting through leaf sheath, racemose, few-flowered. Sepals spreading, keeled; petals slightly narrower. Lip sessile on column, immobile, concave; midlobe drawn out into a 2-fid prow; disc keeled. Column short, without foot. Pollinia 2, globose; caudicle short.

Diploprora championi (Lindl.) J. Hooker, Fl. Brit. India 6: 26. 1890 & Ic. Pl. t. 2120. 1892. *Cottonia championi* Lindl., Hooker's J. Bot. Kew Gard. Misc. 7: 35. 1855.

Sepals, petals yellow with red disc.

S. E. Asia, Sri Lanka, now S. India. Rare in the Ghats. June-August. *CJS* 14498, *HFP* 2874.

Note: This is the first report of the genus for peninsular India.

DISPERIS Swartz

Slender, erect, sparingly branched, tuberous terrestrial herbs with 1-2 ochreate sheaths. Leaves few, sessile. Inflorescence 2-5-flowered, bracteate. Dorsal sepal fused to lateral petals. Lateral sepals fused, generally each with a depression. Lip 3-lobed with lateral lobes horn-like. Column short with 2 spiral lateral lobes. Pollinia 2, each with double row of ovate lobes attached to caudicle and gland. Capsule narrowly elliptical, ribbed.

Disperis zeylanica Trimen, J. Bot. 23: 245. 1885. *Disperis tripetaloides* sensu Lindley, Gen. Sp. Orch. 371. 1839 ('*tripetaloidea*') [excl. basionym *Dryopeia tripetaloides* Du Petit-Thouars, 1822]; Wight, Ic. t. 930. 1844-45. *Disperis neilgherrensis* auct. non Wight, 1851: Gamble, Fl. Madras 1477(1032). 1928.

Leaves 1-2, cordate-amplexicaul, acute, entire, to 1.5×2 cm. Flowers pink with purple striations. Cornua of lip lateral, papillose; midlobe terminating on yellow knob.

South W. India, Sri Lanka. Abundant under light cover in the upper Ghats. June-July. *CJS* 10753, *HFP* 189.

Note: S. Indian species of *Disperis* have been described under four different names—*D. tripetaloidea, D. neilgherrensis, D. zeylanica* and *D. monophylla.* The first, based on *Dryopeia tripetaloides* Thouars, a plant from the Mascarene Islands was applied to Sri Lanka plants

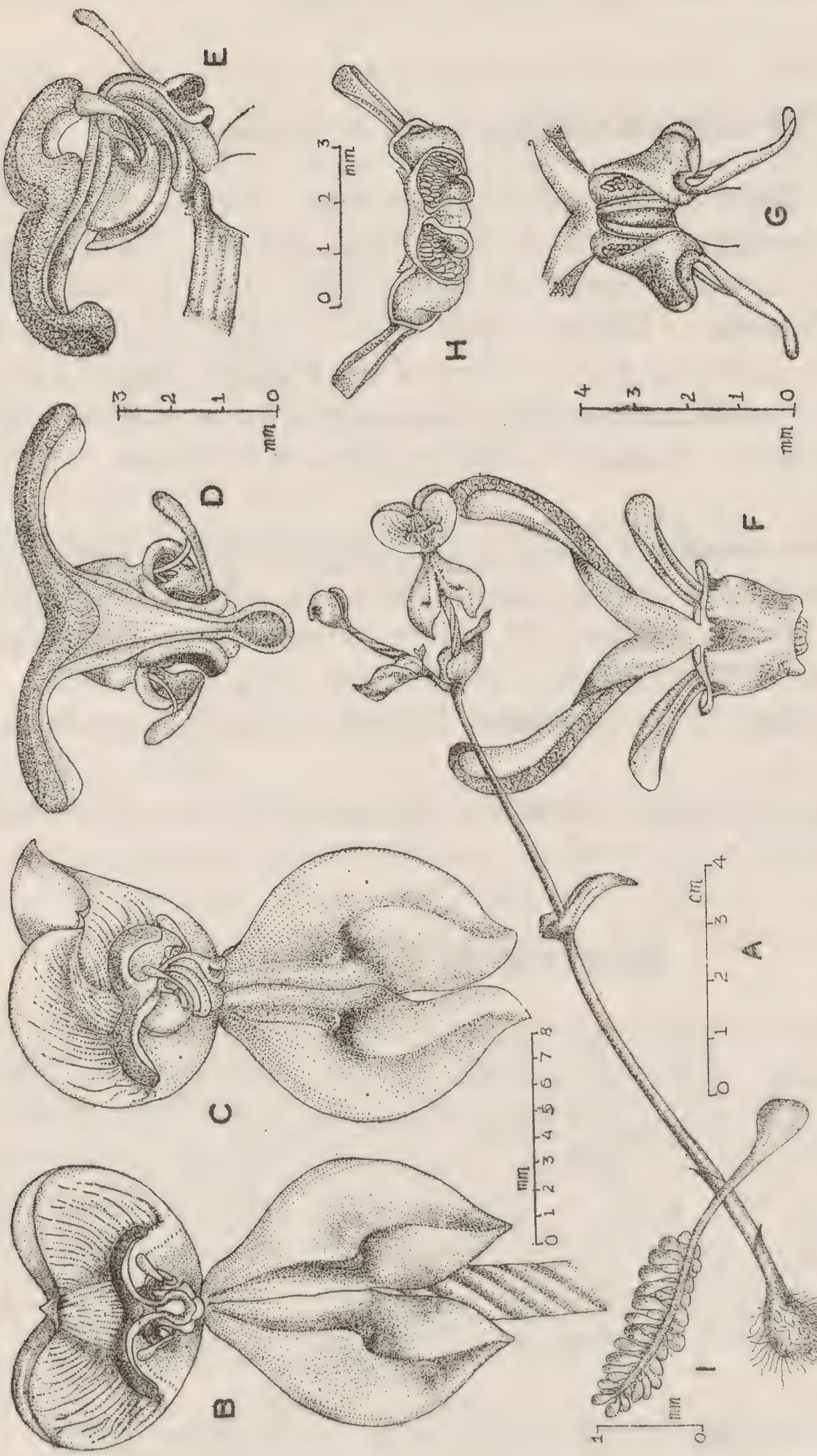


Fig. 125. *Disperis zeylanica*: *A*, habit; *B*, *C*, flowers; *D*, *E*, *F*, lip with column; *G*, *H*, column; *I*, pollinium.

by Lindley and to S. Indian plants by Wight. Trimen segregated the Indo-Ceylonese plants under the name *D. zeylanica*. Fischer in Gamble reduced this to synonomy under *D. neilgherrensis* Wight, a distinct species well illustrated in Wight, *Ic.* t. 1719. 1851 and having serrate leaves and erect cornua. *D. monophylla* Blatter ex Fischer might prove to be conspecific with *D. zeylanica* Trimen. One specimen on Blatter's sheet (No. 545, K.) has 2 leaves.

EPHEMERANTHA Hunt & Summerhayes

Epiphytes. Rhizome annulate, creeping. Stem with uninodal pseudobulbs bearing solitary, coriaceous leaves. Inflorescence of 1-few fascicled, fugacious flowers at base of leaf. Dorsal sepal and lateral petals free, subsimilar. Lateral sepals adnate to foot of column, forming mentum. Lip sessile, at tip of column-foot, 3-lobed; lateral lobes short, rounded at tip; midlobe elongate, expanding into a winged (diverging) apex; disc lamellate. Column oblong; pollinia 4, in 2 pairs, ecaudiculate.

Ephemerantha macraei (Lindl.) Hunt et Summerh., Taxon 10: 105. 1961. *Dendrobium macraei* Lindl., Gen. Sp. Orch. 75. 1830; Sant. & Kap., Orch. Bombay 79. 1966. *Desmotrichum fimbriatum* auct. non Blume, 1825: Gamble, Fl. Madras 1412(987). 1928.

Branches ending in pseudobulbs. Flowers solitary, fugaceous, white speckled with red.

India, Sri Lanka, Burma. Scattered in upper Ghats. July-December. *CJS* 10251, 14567.

EPIPOGIUM R. Brown

Perennial, leafless, achlorophyllous, saprophytic herbs with subterranean horizontal, fleshy, tuberous rhizome. Stem hollow, erect, sheathed. Inflorescence a lax raceme, few-many-flowered; flower with globose ovary distinct from the narrow pedicel, resupinate. Sepals, petals subequal, similar, narrow, free, erect or spreading; lip broader, sessile on short column, saccate or spurred at base, sometimes 3-lobed, undulate, erose, with a median ridge; disc with rows of papillae. Anther 2-celled; pollinia 2, powdery, each with its own long, thin, caudicle, eglandular.

Epipogium roseum (D. Don) Lindl., J. Linn. Soc., Botany 1: 177. 1857; Sant. & Kap., Orch. Bombay 237. 1966. *Limodorum roseum* D. Don, Prodr. Fl. Nepal. 30. 1825. *Epipogium nutans* Reichb. f., Bonplandia 5: 36. 1836; Gamble, Fl. Madras 1460(1021). 1928 ('*Epipogum*'). *Podanthera pallida* Wight, Ic. t. 1759. 1851.

Plant more or less straw colored. Flowers transparent white speckled with pink.

West Africa, Indomalaysia. Scattered in Ghats; in shade, on sandy humus. December-May. *CJS* 15968, *HFP* 119.

ERIA Lindley *nom. cons.*

Epiphytes with swollen or depressed pseudobulbs. Flowers generally in racemes. Dorsal sepal and lateral petals free; lateral sepals adnate to the foot of column. Lip sessile at tip of foot, more or less distinctly 3-lobed, non-spurred. Column short. Stamen 1; anther 2-celled. Pollinia 8, pyriform, united in two groups of 4 with slender membranous caudicles.

1 Flower solitary, more than 2 cm long.....*E. reticosa*
1 Flowers in racemes or spikes.
2 Pseudobulbs swollen, elongate.
3 Flower 0.4 cm; lip with a pair of lateral papillae at base.....*E. albiflora*
3 Flower 1.2 cm; lip without any papillae.....*E. mysorensis*
2 Pseudobulbs depressed, discoid.
4 Leafless in flower; scape zig-zag; flower 0.3 cm, greenish-white.....*E. exilis*
4 Leafy in flower; scape straight; flower 0.6-0.8 cm, yellow.
5 Sepals and petals with 2 rows of capitate glands.....*E. dalzellii*
5 Sepals and petals glabrous.....*E. microchilos*

Eria albiflora Rolfe, Bull. Misc. Inform. 170. 1893; Gamble, Fl. Madras 1425(996). 1924.

Leafy in flower. Inflorescence fulvous hairy; flowers white. Lip with 2 lateral papillae at base; margin thickened and involute at apex.

Nilgiris in South W. India, now Hassan. Collected only once. In partial shade, on trees at Kenchankumri State Forest, middle Ghats, Shiradi. August. *HFP* 2038.

Eria dalzellii (Dalz.) Lindl., J. Linn. Soc., Bot. 3: 47. 1858 (excl. descript.) ('*dalzelli*'); Gamble, Fl. Madras 1425(996). 1928; Sant. & Kap., Orch. Bombay 151. 1966. *Dendrobium dalzellii* Hooker ex Dalz., Hooker's J. Bot. Kew Gard. Misc. 4: 292. 1852.

Leafy when in flower. Flowers yellow, secund on a raceme. Sepals, petals with two rows of minute capitate glands. Lip pandurate, concave at base; margins incurved along the middle; yellow ridges 2 from the base which unite and pass into the rounded tip.

South W. India. Common in shade, on wet tree trunks, in upper Ghats. August-September. *CJS* 14594, *HFP* 2005.

Eria exilis J. Hooker, Fl. Brit. India 5: 788. 1890; Gamble, Fl. Madras 1425(996). 1924; Sant. & Kap., Orch. Bombay 150. 1966.

Leafless when in flower; the whole plant less than 5 cm. Lip very short, sunk in the mentum, more or less oblong, concave in lower half, fleshy, with 2 central ridges.

India, Thailand. Common in upper Ghats. October-April. *CJS* 12909, *HFP* 2782.

Eria microchilos (Dalz.) Lindl., J. Linn. Soc., Bot. 3: 47. 1858; Sant. & Kap., Orch. Bombay 154. 1966. *Dendrobium microchilos* Dalz., Hooker's J. Bot. Kew Gard. Misc. 3: 345. 1851.

Flowers not secund. Sepals and petals glabrous. Lip linear-lanceolate, rounded and truncate at tip, crenulate, minutely puberulous.

South W. India. Collected only once at Vanagur, in upper Ghats. Found growing amidst *E. dalzellii* Lindl. August. *HFP* 2004.

Eria mysorensis Lindl., J. Linn. Soc., Bot. 3: 54. 1858; Sant. & Kap., Orch. Bombay 149. 1966. *Eria pubescens* Wight, Ic. 5(1): 4. 1851 (non Lindley 1825); Gamble, Fl. Madras 1425(996). 1928.

Pseudobulbs ovoid. Flowers yellow, to 1.2 cm. Lip pandurate, constricted in the middle, arcuate, very shortly clawed, 3-ridged, crested near apex, reddish-brown towards base.

South W. India. Common in upper Ghats. July-October. *HFP* 576, 951.

Note: Fischer (in Gamble, Fl. Madras *l.c.*) considers *E. mysorensis* Lindl., as a synonym of *E. polystachya* A. Rich. rather than of *E. pubescens* Wt. The affinities of *E. polystachya* A. Rich. (1841), *E. pubescens* Wt. (Ic. t. 1634. 1851) and *E. mysorensis* Lindl. (1858) are still confusing despite the comments of Santapau and Kapadia (*l.c.*).

Eria reticosa Wight, Ic. t. 1637. 1851; Sant. & Kap., Orch. Bombay 146. 1966. *Eria bracteata* Dalz. & Gibs., Bombay Fl. 262. 1861, non Lindl., 1859; Gamble, Fl. Madras 1425(996). 1928.

Flower white, solitary, to 2.5 cm. Lip linear-oblong, 3-lobed; lateral lobes 1.2 cm, narrow, yellow; crests 2, running from base to beyond the lateral lobes.

South W. India. Common in upper Ghats, on trees and wet rocks. July-September. *CJS* 13796, *HFP* 1880.

EULOPHIA R. Brown *nom. cons.*

Perennating, rhizomatous, terrestrial herbs. Flowers and leaves simultaneous or succeeding one another. Flowering scape lateral. Inflorescence an erect, pedunculate raceme. Lateral sepals often connate with the foot of column. Lip saccate or spurred at base, 3-lobed, rarely subentire; disc variously crested or lamellate, rarely naked. Column often produced into a foot, provided with lateral wings or not. Anther 2-celled; pollinia 2, waxy, attached to a short caudicle and a narrow flat, disc-shaped gland.

1 Flower green-purple; lip twice as long as broad; midlobe elongate, obtuse; disc with 8-10, fleshy, crenulate nerves ..... *E. nuda*

1 Flower reddish-brown; lip as long as broad; midlobe short; disc with 2 fleshy ridges ..... *E emilianae*

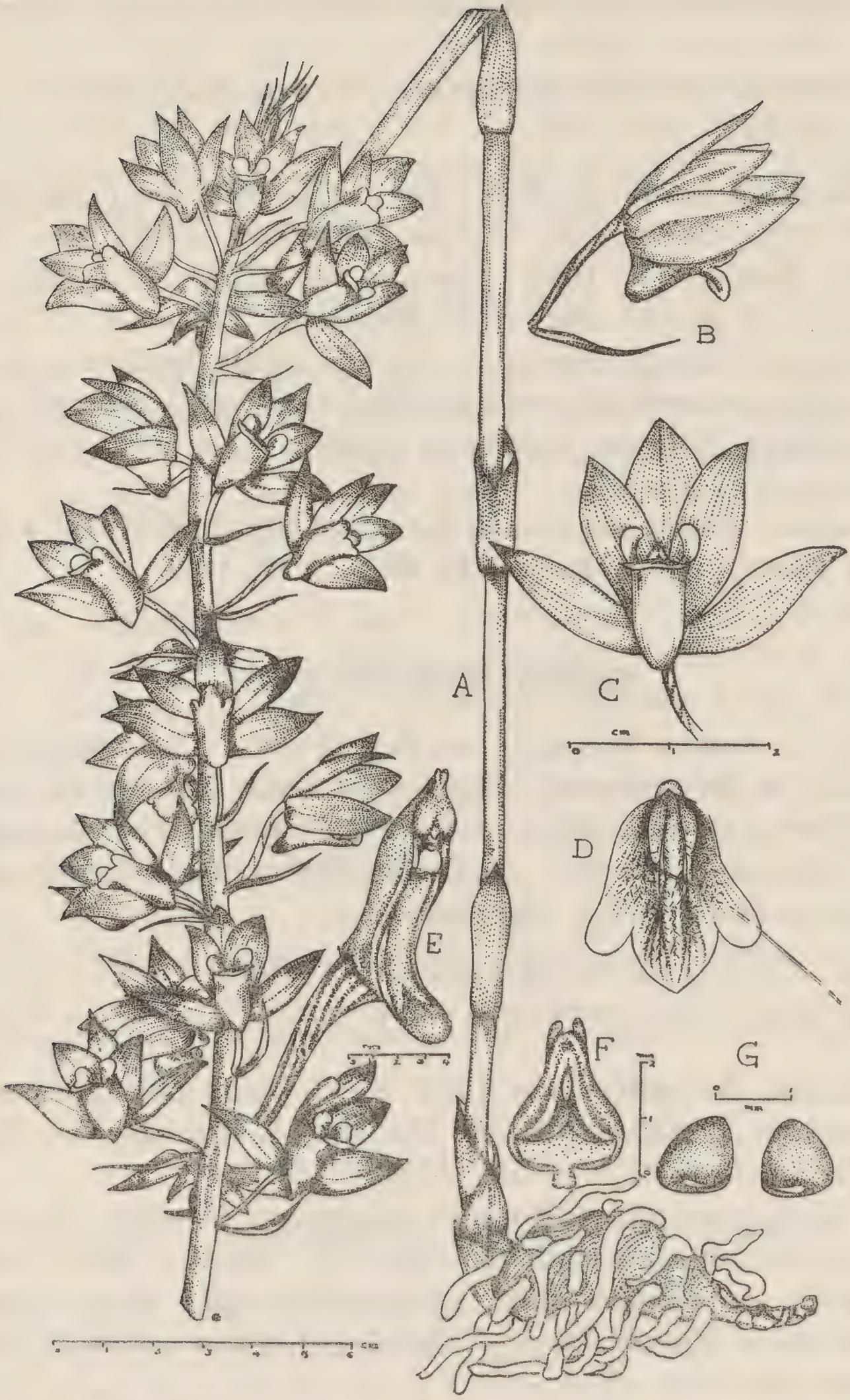


Fig. 126. *Eulophia emilianae*: *A*, habit; *B*, *C*, flowers; *D*, lip; *E*, column; *F*, operculum; *G*, pollinia.

Eulophia emilianae Saldanha, Indian Forester 100: 566, t. 1. 1974.

Rhizome hypogeal. Leaves after flowering. Scape lateral, greyish white. Flowers reddish-brown suffused with grey. Column-foot present. Lip as long as broad, with 2 ridges and about 7 hairy veins; midlobe acute, entire.

On humus in semi-evergreen forests. Flowers April; fruits May; leaves July. *CJS* 16923, *HFP* 1782.

Eulophia nuda Lindl., [in Wall., List. 7371. 1832, *nom.*] Gen. Sp. Orch. 180. 1833; Gamble, Fl. Madras 1435(1003). 1924; Sant. & Kap., Orch. Bombay 115. 1966. *Cyrtopera fusca* Wight, Ic. t. 1690. 1851.

Leaves 1-1.5 m×14 cm, after flowering. Scape 0.5-0.75 m long; flower 2.2 cm long, green-purple. Lateral sepals fused with the foot of column. Lip spurred (spur conical), 3-lobed; lateral lobes small; midlobe obovate-oblong, elongate, crenulate, recurved; disc with 8-10 crenulate fleshy nerves.

Indomalaysia. Fairly common in the upper Ghats (Harihalli, Chikkanahalli) in shade. April-May. *CJS* 9821, *HFP* 1704.

GASTROCHILUS D. Don

Epiphytes. Leaves unequally notched at apex. Inflorescence lateral, often 2 at a node, racemose. Sepals and petals free, sub-similar. Lip saccate with transverse midlobe on rim of sac, sometimes hairy or fimbriate. Calli or septa absent in sac. Anther 2-celled; pollinia 2, globular, each with a depression or dent; stipe narrow.

1 Sac of lip not keeled; midlobe yellow; column yellowish.....*G. pulchellus*
1 Sac of lip keeled; midlobe spotted red; column pink.....*G. flabelliformis*

Gastrochilus flabelliformis (Blat. & McCann) Saldanha, *comb. nov.* *Saccolabium flabelliforme* Blat. & McCann, J. Bombay Nat. Hist. Soc. 35: 722. t. 1. 1931.

Sepals and petals greenish-white, subsimilar, obovate. Lip saccate, keeled; midlobe transverse, dotted with red. Column pink at side.

N. Kanara, now Hassan. Rare in evergreen forests along Kempuhole River, at lower Shiradi Ghat. October-November. *CJS* 11513, *HFP* 954. (Plate 15).

Note: Santapau and Kapadia Orch. Bombay 226. 1966) have reduced this to *Gastrochilus dasypogon* (Sm. ex Rees) O. Kuntze. The keeled spur, absence of lateral lobes on the cup of lip, floral color and distribution make this an easily recognizable species in fresh condition.

Gastrochilus pulchellus (Wight) Schlechter, Feddes Repert. 12: 315. 1913. *Vanda pulchella* Wight, Ic. t. 1671. 1851. *Saccolabium pulchellum*

(Wight) Fischer in Gamble, Fl. Madras 1446(1011). 1928. *Gastrochilus dasypogon* auct. non (Rees) Kuntze: Sant. & Kap., Orch. Bombay 226. 1966.

Sepals and petals greenish-white. Midlobe of lip white with raised central, yellow portion. Sac of spur without keel, tinged with yellow.

South W. India. Common along upper Ghats. March-October. *CJS* 9820, *HFP* 2809. (Plate 16).

Note: Rathakrishnan (Bull. Bot. Surv. India 13: 3. 1973) reduces this species to *G. calceolaris* (Buch.-Ham. ex Sm.) Don. We prefer to keep the two separate.

GEODORUM Jackson

Terrestrial. Pseudobulbs exposed, persistent. Leaves 2-many; uppermost largest. Scape lateral, simultaneous with leaves, elongate, with drooping terminal portion. Sepals and petals subsimilar; petals slightly broader. Lip saccate attached to foot. Column-foot short. Anther cap with 2 flaps. Pollinia 2.

Geodorum densiflorum (Lam.) Schlechter, Feddes Repert. 4: 259. 1929; Gamble, Fl. Madras 1437(1004). 1928; Sant. & Kap., Orch. Bombay 203. 1966. *Limodorum densiflorum* Lam., Encycl. 3: 516. 1792.

Flowers white suffused with pink. Sepals and petals not spreading. Lip emarginate with purple markings on inner surfaces. Epichile with 2 yellow patches. Pollinia depressed at center with separate hair-like caudicles.

India, Sri Lanka, Malaysia. Rare in upper Ghats. June-July. *HFP* 2901.

Note: Santapau & Kapadia (*l.c.*) have discussed the variations and synonymy of this orchid.

HABENARIA Willdenow

Note: The genus is being considered in its restricted circumscription as defined by J. J. Smith.

Tuberous herbs, generally terrestrial, rarely epiphytic (*H. crinifera*). Stem seasonal, either with 1-3 leaves lying flat on the ground or erect, often with lower sheath followed by 2-many leaves and narrower bracts. Inflorescence terminal, bracteate. Flowers white, yellow or green, resupinate. Median sepal generally galeate; laterals similar to median or dissimilar, often oblique, attached to top of ovary. Petals entire or divided. Lip spurred, 3-lobed. Pollinia 2, with long caudicles enclosed in tubes. Stigmatic surfaces 2, distinct, convex or on elongated processes. Capsules generally patent, elliptic, often curved or beaked.

1 Petals lobed.
2 Leaves 1-3, subcordate, flat on the ground.....*H. grandifloriformis*
2 Leaves 3-many, spiral on erect stem.
3 Petals densely ciliate along margin of one lobe.....*H. elwesii*
3 Petals glabrous.....*H. multicaudata*
1 Petals entire.
4 Terminal lobe of lip divided.....*H. crinifera*
4 Terminal lobe of lip undivided.
5 Lateral lobes of lip broader than midlobe, oblique at apex.
6 Leaves flat on ground; spur to 3 cm.....*H. plantaginea*
6 Leaves clustered near base; spur to 15 cms.....*H. longicorniculata*
5 Lateral lobes of lip equal to or narrower than midlobe.
7 Leaves flat on ground; spur longer than ovary.....*H. roxburghii*
7 Leaves not flat on ground; spur as long as ovary.
8 Midlobe of lip broad, bent upward toward median sepal.....*H. ovalifolia*
8 Midlobe of lip narrow pointing away from median sepal.
9 Bracts less than half the length of the ovary.....*H. viridiflora*
9 Bracts more than half the length of the ovary.
10 Flowers secund or subsecund.....*H. heyneana*
10 Flowers not secund or subsecund.....*H. marginata*

Habenaria crinifera Lindl., Gen. Sp. Orch. 323. 1835; Wight, Ic. t. 926. 1845; Gamble, Fl. Madras 1471(1028). 1928; Sant. & Kap., Orch. Bombay 26. 1966.

Leaves cauline, elliptic-lanceolate. Petals entire. Lip with oblique, caudate lobes; midlobe bifid.

Western Peninsular India, Sri Lanka. Abundant in wet deciduous to semi-evergreen forests, generally epiphytic. Flowering August-September; fruiting September-October. *CJS* 11150, *HFP* 472.

Habenaria elwesii J. Hooker, Bot. Mag. t. 7478. 1896; Gamble, Fl. Madras 1468(1026). 1928.

Leaves cauline, elliptic. Petals bilobed; longer lobe straight, villous; lower shorter, curved. Lip narrowly 3-lobed.

Endemic to Southern Western Ghats. Rare in upper Ghats. September-October. *CJS* 11147.

Habenaria grandifloriformis Blatter & McCann, J. Bomb. Nat. Hist. Soc. 36: 17. 1932 *emend.* Sant. & Kap., *ibid.* 56: 195. 1959. *Habenaria grandiflora* Lindl. [in Wall., List. 7032. 1828, *nom.*] ex Dalzell & Gibson, Bombay Fl. 267. 1861; Gamble, Fl. Madras 1469(1027). 1928, non Torrey ex Beck, 1833.

Leaves 1-2, flat on ground, cordate-rounded. Flowers 1-5; petals bilobed. Lip with 3 narrow lobes; spur longer than ovary.

Deccan, Western Peninsular India. Gregarious forming carpets of white flowers from mid-June to early July on grassy slopes in upper Ghats and western plains. One of the earliest monsoon orchids. *CJS* 14019, *HFP* 174.

Habenaria heyneana Lindl., Gen. Sp. Orch. 320. 1835; Wight, Ic. t. 1710. 1851; Gamble, Fl. Madras 1471(1028). 1928; Sant., Rec. Bot. Surv. India 16(1): 308. 1953.

Leaves few, cauline. Bracts longer than ovary. Flowers creamy white, to subsecund. Petals entire. Capsules patent or appressed to axis.

Deccan, Western Peninsular India. Common on exposed hill-sides among grasses in upper Ghats (600-1000 m). August-September. *CJS* 14615, *HFP* 727.

Habenaria longicorniculata Graham, Cat. Pl. Bombay 202. 1839; Sant. & Kap., Orch. Bombay 29. 1966. *Habenaria longecalcarata* A. Rich., Ann. Sci. Nat. Bot. ser. 2, 15: 71, t. 313. 1841; Wight, Ic. t. 925. 1845; Gamble, Fl. Madras 1470(1027). 1928.

Leaves 2-6, near base. Flowers 1-4, toward tip of scape, greenish-white. Petals entire. Lip 3-lobed; midlobe narrower than lateral lobes; spur to 15 cm, swollen and greenish toward tip.

Hills of Peninsular India. Common on well-drained grassy hillsides in upper Ghats. August-October. *CJS* 10077, *HFP* 755.

Habenaria marginata Coleb. in Hooker, Exotic Bot. t. 136. 1825; Gamble, Fl. Madras 1471(1028). 1928; Sant. & Kap., Orch. Bombay 33. 1966.

Leaves toward base, with yellow margins. Flowers yellow; petals entire; lateral lobes of lip equal to midlobe; spur shorter than ovary.

India, Burma. Common on open grassy plateaux in western plain. October. *CJS* 17998, *HFP* 2172.

Habenaria multicaudata Sedgewick, Rec. Bot. Surv. India 6: 352. 1919; Gamble, Fl. Madras 1469(1026). 1928; Sant. & Kap., Orch. Bombay 14. 1966.

Leaves cauline, toward middle of stem. Flowers greenish-white; petals glabrous, bilobed; lobes filiform; lower longer, arched. Lip with filiform arched lateral lobes and shorter midlobe; spur curved, shorter than ovary, swollen toward tip.

N. Kanara to Anamalais on Western Ghats. Rare. In upper Ghats (Vanagur) at forest edge. The spider-like flowers are very distinctive. August-October. *HFP* 516.

Habenaria ovalifolia Wight, Ic. t. 1708. 1851; Gamble, Fl. Madras 1471(1028). 1928; Sant. & Kap., Orch. Bombay 37. 1966.

Leaves cauline, toward lower half of stem. Flowers green, petals entire; midlobe of lip arched upward toward dorsal sepal.

Western Peninsular India. Occasional in upper Ghats under light cover. August-October. *CJS* 17954, *HFP* 864.

Note: Sant. & Kap., (*l.c.*) indicate the possibility of this name being reduced to synonomy under *H. modesta* Dalzell (1850).

Habenaria plantaginea Lindl., Gen. Sp. Orch. 323. 1835; Wight, Ic. t. 1710. 1851; Gamble, Fl. Madras 1420(1027). 1928. *Orchis platyphyllos* auct. non Willd. (1805): Roxb., Fl. Ind. 3: 450. 1832.

Leaves basal, generally flat on ground. Flowers white; petals entire. Lip with narrow midlobe and oblique broader lateral lobes; spur longer than ovary.

India, Sri Lanka. Occasional in drier regions of eastern plain (Bourdalboore State Forest). October. *CJS* 15132, *HFP* 753.

Habenaria roxburghii Nicolson, *nom. nov.* *Orchis plantaginea* Roxb., Pl. Cor. 1: 32, t. 37. 1795 [non *Habenaria plantaginea* Lindl., 1835]. *Orchis platyphyllos* Willd., Sp. Pl. 4: 11. 1805, nom. superfl. (incl. *O. plantaginea* Roxb.) *Orchis roxburghii* Persoon, Syn. Pl. 2: 503. 1807, nom. superfl. (incl. *O. plantaginea* Roxb.) *Habenaria platyphylla* Spreng. Syst. Veg. 3: 690. 1826, nom, superfl. (incl. *O. plantaginea* Roxb.); Wight, Ic. t. 1709. 1851; Gamble, Fl. Madras 1470(1027). 1928; Sant. & Kap., Orch. Bombay 19. 1966.

Leaves 1-3, flat on ground. Flowers white; petals entire; lateral sepals longer than lip; spur longer than ovary.

Peninsular India. Common in poor dry soil of eastern plains and hills. In scrub under light cover. July-October. *CJS* 14087, *HFP* 390.

Habenaria viridiflora (Swartz) R. Brown, Prodr. 312. 1810; Wight, Ic. t. 1705. 1851; Gamble, Fl. Madras 1471(1028). 1928; Sant. & Kap., Orch. Bombay 35. 1966. *Orchis viridiflora* Swartz, Kongl. Vetensk. Acad. Nya Handb. 21: 206. 1800.

Leaves narrowly elliptic-lanceolate, crowded near base. Flowers greenish; bracts shorter than ovary; lip white at base; lateral lobes narrow; midlobe pointing away from dorsal sepal.

Peninsular & E. India, Sri Lanka. Common in open moist grasslands in plains (Byra, Vatehalla). August-October. *CJS* 15219, *HFP* 484.

LIPARIS L. C. Richard *nom. cons.*

Terrestrial or epiphytic. Leaves flat or plicate. Inflorescence terminal, racemose or spicate. Sepals free, ovate-lanceolate, acute; petals similar to sepals except considerably narrower, free. Sepals and petals erect or reflexed. Lip sessile on column, not spurred. Column usually long, curved, often winged, without foot. Anther 2-celled; pollinia waxy. ovoid, 4, united in pairs at tips.

1 Terrestrial; leaves flat on ground; lip suborbicular, erect.....*L. prazeri*
1 Epiphytes; leaves erect; lip ovate, acute, recurved from middle.....*L. viridiflora*

Liparis prazeri King & Pantling, J. Asiat. Soc. Bengal, pt. 2, Nat. Hist. 66: 582. 1897; Sant. & Kap., Orch. Bombay 179. 1966. *Liparis flavo-viridis* Blatter & McCann, J. Bombay Nat. Hist. Soc. 35: 260, t. 6. 1931.

Terrestrial. Pseudobulbs ovoid, hypogeal. Leaves ovate, flat on ground. Flowers greenish-yellow; lateral petals and sepals below the upwardly arched broad lip; lip rounded, minutely denticulate with 2 callosities near base.

India, Burma. Locally abundant in a bamboo thicket at Chickanahalli (upper Ghats). August. *HFP* 468.

Liparis viridiflora (Blume) Lindl., Gen. Sp. Orch. 31. 1830; Holttum Rev. Fl. Malaya ed. 3, 1: 205. 1964. *Malaxis viridiflora* Blume, Bijdr. 392. 1825. *Liparis longipes* Lindl. in Wall., Pl. Asiat. Rar. 1: 31, t. 35. 1830; Wight, Ic. t. 906. 1844-45; Gamble, Fl. Madras 1410(987). 1928.

Epiphytic, sympodial, pseudobulbous. Leaves erect, narrowly obovate-oblong. Racemes terminal. Flower yellow; column curved, not winged; lip recurved.

India to Philippines. Common in upper and middle Ghats. September-November. *CJS* 10289, 17940.

Note: Fischer in Gamble (*l.c.*) distinguishes between *L. longipes* and *L. viridiflora*. He cites *L. elliptica* Wight as a synonym of the latter. Our treatment is adopted from Holttum (*l.c.*). Seidenfaden & Smitinand, *Orch. Thailand* 178. 1959 have taken a similar view.

LUISIA Gaudichaud

Epiphytes. Stem elongate, terete. Leaves fleshy, terete. Inflorescence extra axillary, of many-flowered spikes, rarely solitary. Flowers large or small, resupinate. Sepals subequal, the dorsal smaller; the laterals usually apically keeled, cymbiform; petals like sepals or differing. Lip sessile on column, immobile, hardly lobed; base often flat or concave, apically entire, shortly 3-lobed or unsegmented; the epichile separated from hypochile by a narrow furrow. Column narrow, straight; column-foot none. Anther 2-celled; pollinia 2, globular, furrowed; caudicle flat.

1 Flowers large; petals linear, longer and narrower than sepals; lip oblong, constricted just before broadening into divergent apical lobes..... *L. macrantha*
1 Flowers small; petals like sepals; lip ending in triangular cordate lobe..... *L. zeylanica*

Luisia macrantha Blatter & McCann, J. Bombay Nat. Hist. Soc. 35: 492, t. 10. 1932; Sant. & Kap., Orch. Bombay 217. 1966.

Leaves uniformly terete. Flowers solitary, large. Petals linear, arched, longer than sepals. Lip elongate, greenish with dark purple patch at base, constricted subapically, finally ending in 2 divergent purple lobes.

North Kanara, now Hassan. Rare in Ghats. March-November. *CJS* 11515, *HFP* 1510.

Luisia zeylanica Lindley, Folia Orch. Luisia 3, 1853; Seidenfaden, Dansk Bot. Arkiv 27(4): 62. 1971. *Luisia teretifolia* auct. non Gaud. (1826): Gamble, Fl. Madras 1948(1005). 1928; Sant. & Kap., Orch. Bombay 213. 1966.

Leaves not constricted apically. Flowers clustered. Sepals and petals subsimilar. Lip ending in triangular-cordate lobe separated from hypochile by a transverse furrow, uniformly maroon.

Indomalaysia including China. Common in upper Ghats and western plains. September-October. *CJS* 9332, 11306.

Note: Another plant with thinner leaves, smaller flowers and lip with purple spots is common in the area. Its exact taxonomic position has to be determined after further study. *CJS* 10306, 11303, 13224, 16704. March-April.

MALAXIS Solander ex Swartz

Terrestrial; stem creeping and ascending, often with a pseudobulb; leaves 1-many, membranous, not articulated. Inflorescence terminal, racemose, usually dense. Flowers small, not resupinate. Sepals and petals free, expanded, often recurved or incurved. Lip sessile, not spurred, usually embracing column at base, rarely exauriculate, 1-3 lobed; median lobe incised. Column without foot. Anther 2-celled; pollinia 4, in pairs, ovoid or obovoid, sessile.

Malaxis versicolor (Lindl.) Abeywickr., Ceylon J. Sci., Biol. Sci. 2: 147. 1959; Sant. & Kap., J. Bombay Nat. Hist. Soc. 58: 347. 1961. *Microstylis versicolor* Lindl., Gen. Sp. Orchid. 21. 1830; Gamble, Fl. Madras 1408(985). 1928.

Stem erect, swollen at base. Leaves membranous, green-purple. Bracts reflexed. Flower greenish-yellow to purple. Lip semi-circular, pectinate except at tip.

India, Sri Lanka. Common in shade, on decaying humus in upper Ghats. Flowering May-August; fruiting September-October. *CJS* 13708, *HFP* 184.

NERVILIA Commerson ex Gaudichaud *nom. cons.*

Terrestrial orchids with subterranean, subglobose, perennating tubers. Leaves usually appearing after flowers, orbicular-cordate or sometimes rounded, with diverging veins. Inflorescence on a slender scape, racemose, 1-few-flowered. Flowers resupinate; sepals erect or spreading; petals like sepals but smaller, both usually narrow, lanceolate. Lip

entire or 3-lobed, not spurred; base clasping column, usually recurved at apex; column long, thickening at apex. Anther opercular, incumbent or suberect, 2-celled; pollinia furrowed, powdery, ecaudiculate.

Key to species, based on flowers:

1 Flower solitary.....*N. prainiana*
1 Flowers 2-5.
 2 Lip entire, not lobed.....*N. plicata*
 2 Lip lobed.....*N. aragoana*

Key to species, based on leaf:

1 Leaf very shortly petioled, orbicular, cordate at base, nearly flat on ground..*N. prainiana*
1 Leaf long-petioled, ovate.
 2 Leaves cordate, hastate at base, undulate along margin.....*N. aragoana*
 2 Leaves rounded at base, not undulate along margin.....*N. plicata*

Nervilia aragoana Gaudichaud in Freycinet, Voy. Bot. 422, t. 35. 1826; Gamble, Fl. Madras 1459(1020). 1928; Sant. & Kap., Orch. Bombay 134. 1966.

Leaf long-petiolate, cordate-hastate at base, acute at tip, with undulating margin. Inflorescence 5-flowered; flower 2.5 cm long, greenish-yellow. Lip shortly 3-lobed; lateral lobes short, midlobe subacute, irregularly crenulate; nerves fleshy, purple.

Indomalaysia. Common in upper Ghats. In shade, on loose moist humus. Flowers in May. In leaf to October. *HFP* 474, 1705.

Note: The differences between *N. aragoana* and *N. carinata* are not well defined. Flowers when young are non-saccate at base; after fertilization a small saccate structure develops at the base of the lip. Both types of flowers have been observed in the same plant. Leaf venation and flower color can vary. *N. carinata* is supposed to have fewer nerves.

Nervilia plicata (Andrews) Schlechter, Bot. Jahrb. 45: 403. 1911; Gamble, Fl. Madras 1458(1020). 1928. *Arethusa plicata* Andrews, Bot. Rep. t. 321. 1802.

Leaf petiolate, ovate, rounded at base, not undulate. Inflorescence 1-3-flowered; flower 2.5-3 cm, greenish-yellow; lip convolute at base, broadening out at tip into a purple entire lobe with a median yellowish ridge.

South W. India, and lower Bengal in the North East. Occasional. Locally common at Chikkanahalli (upper Ghats), in shade, on humus. Flowers in May followed by leaves. *HFP* 1706.

Nervilia prainiana (King & Pantling) Seidenfaden & Smitin., Orch. Thailand 730. 1964. *Pogonia prainiana* King & Pantling, J. Asiat. Soc. Bengal 65(2): 129. 1896; Ann. Roy. Bot. Gard. (Calcutta) 8: 267, t. 355. 1898.

Leaf hairy, reniform-cordate, flat on ground. Flower solitary, 1.8 cm long. Sepals, petals yellow; lip purple, 3-lobed; lateral lobes as long as midlobe, rounded; midlobe fimbriate; nerves fleshy, hairy.

Sikkim, now Hassan. Common in upper Ghats, in loose sandy soil, usually in shade of large trees. Flowers in May; leaves to August. *HFP* 586, 1710.

Note: *Nervilia monantha* Blatter et McCann is closely allied to this species and may prove to be conspecific.

OBERONIA Lindley *nom. cons.*

Epiphytes. Stem none. Leaves equitant, fleshy, laterally much compressed. Inflorescence a terminal spike of crowded cymes. Flowers small, yellow or orange-brown, uppermost ones usually opening first. Lip sessile, entire or 3-lobed, without spur. Column very short, without foot. Pollinia waxy, sessile, 4, in pairs, without caudicles.

1 Petals ovate, as broad as sepals.
 2 Leaves to 5 cm; all lobes of lip dentate..... *O. brachyphylla*
 2 Leaves to 30 cm; lobes of lip not dentate..... *O. ensiformis*
1 Petals linear, narrower than sepals.
 3 Leaves olive-brown; flowers brown..... *O. brunoniana*
 3 Leaves not olive-brown; flowers yellow or orange.
  4 Lateral lobes of lip narrower than midlobe, overlapping above column.... *O. josephi*
  4 Lateral lobes of lip broader than midlobe, partially surrounding column, not overlapping..... *O. santapaui*

Oberonia brachyphylla Blatter & McCann, J. Bombay Nat. Hist. Soc. 35: 257, t. 2. 1931; Sant. & Kap., Orch. Bombay 57. 1966.

Leaves to 5 cm, not articulated. Petals as broad as sepals, dentate. Lobes of lip dentate, lateral lobes not overlapping; sinus of midlobe quadrate.

N. Kanara, now Hassan. Rare. Collected at Kenchankumri State Forest (Shiradi Ghat) on April 13, 1971. *HFP* 1537.

Note: The type illustration shows shorter, broader leaves and an arched sinus on midlobe of lip.

Oberonia brunoniana Wight, Ic. t. 1622. 1851; Gamble, Fl. Madras 1406(984). 1928; Sant. & Kap., Orch. Bombay 69. 1966; Seidenfaden, Dansk Bot. Ark. 25(3): 50, t. 28. 1968.

Leaves articulated, olive brown, fleshy. Flowers brown; petals narrow, reflexed; lateral lobes of lip broader than midlobe, not overlapping.

South W. India. Common in upper Ghats. December-August. *CJS* 10885, *HFP* 1239.

Note: The inflorescence may or may not have a leaf adnate to it. The presence of the adnate leaf is therefore not a specific character.

Oberonia ensiformis (Rees) Lindl., Fol. Orch. Obero. 4. 1852; Gamble, Fl. Madras 1406(984). 1928; Sant. & Kap., Orch. Bombay

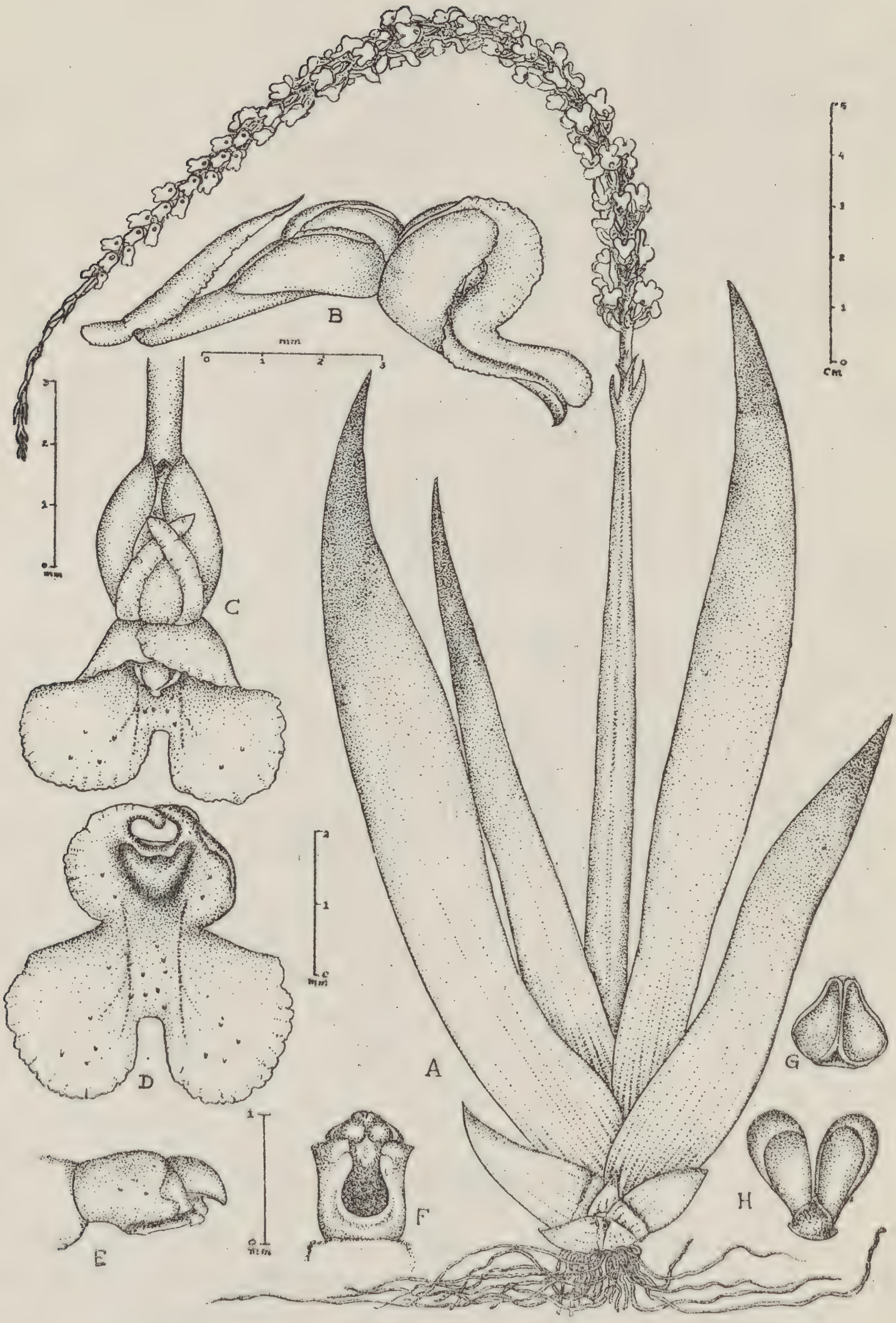


Fig. 127. *Oberonia josephi*: *A*, habit; *B*, *C*, flowers; *D*, lip; *E*, *F*, column; *G*, operculum; *H*, pollinia.

67. 1966; Seidenfaden, Dansk Bot. Ark. 25(3): 53. 1968. *Malaxis ensiformis* J. E. Sm. ex Rees, Cycl. 22: n. 14. 1812.

Leaves to 30 cm, green, articulated. Inflorescence shorter than leaves. Petals ovate, as broad as sepals. Lateral lobes of lip small, not overlapping; midlobe 2-lobed, hairy.

India, Burma, Yunan. Common in upper Ghats. October-November. *CJS* 9331, 10291. The largest of local *Oberonias.*

Note: Santapau & Kapadia as well as Seidenfaden mention a pair of callus pads on the lip. The latter shows a glabrous lip while the former (t. 13) show a lip with all lobes hairy. Our specimens have lips without calli but with hairy midlobes. This seems to agree with *O. ferruginea* Parish as illustrated by Seidenfaden. However, Lindley's sketch on his sheet of *O. ensiformis* (K.) does not show any calli.

Oberonia josephi Saldanha, Indian Forester 100: 569, t. 2. 1974.

Leaves articulated, to 28 cms, green. Inflorescence flattened with 1-2 large bracts just below flowers. Flowers pedicelled, relatively large. Sepals ovate, reflexed. Petals narrower, reflexed and overlapping diagonally. Lip 3-lobed; lateral lobes overlapping and encircling column; midlobe much broader with 2 rounded crenate lobules separated by a quadrate sinus.

Below Genkalbetta, Hassan District (900 m). September-October. *CJS* 15247, 17970, *HFP* 885.

Oberonia santapaui Kapadia, J. Bombay Nat. Hist. Soc. 57: 265. 1960; Sant. & Kap., Orch. Bombay 72. 1966; Seidenfaden, Dansk Bot. Ark. 25(3): 50. 1968. *Oberonia lindleyana* Wight, Ic. t. 1624. 1851, non Brogn. ex Duperr., 1834; Gamble,Fl. Madras 1407 (984). 1928.

Leaves articulated, green. Inflorescence generally without adnate leaf. Petals narrow. Lip with broad lateral lobes, 2-lobed midlobe and prominent semilunar nectary. Column not enclosed by lip.

South W. India. Occasional. Upper Ghats. December. *CJS* 15884, 15885. (Plate 17).

PERISTYLUS Blume *nom. cons.*

Tuberous, terrestrial herbs. Stem seasonal, erect, often with basal sheaths. Leaves either scattered on stem or clustered at about its middle. Flowers spicate or subspicate, greenish to creamy-white, inconspicuous, generally appressed to the axis. Dorsal sepal often galeate; laterals sometimes mucronate. Lip 1-3-lobed. Column short, flanked by staminodes, anther 2-celled. Pollinia 2, powdery, with short caudicles not enclosed in tubes and with exserted glands. Stigmatic lobes separate, convex, sessile. Capsules generally fusiform, slightly beaked, scarcely spreading.

A homogenous group in the District; often included in *Habenaria* Willd.

1 Leaves scattered on stem or basal.
2 Lateral lobes of lip longer than midlobe.....*P. secundus*
2 Lateral lobes of lip shorter than or equal to midlobe.....*P. spiralis*
1 Leaves clustered at about middle of stem.
3 Slender herbs; lateral lobes of lip filiform.....*P. aristatus*
3 Robust herbs; lateral lobes of lip not filiform.....*P. goodyeroides*

Peristylus aristatus Lindl., Gen. Sp. Orch. 300. 1835; Gamble, Fl. Madras 1474(1030). 1928. *Peristylus exilis* Wight, Ic. t. 1698. 1851. *Habenaria aristata* (Lindl.) J. Hooker, Fl. Brit. India 6: 158. 1890.

Slender. Leaves 3-6, clustered toward middle of stem. Flowers lax, green with short bulbous spur. Lobes of lip from lower side of boat-shaped structure.

E. Himalayas, S. India, Sri Lanka. In undergrowth of semi-evergreen forests in upper Ghats (550-990 m). Flowers in August; fruits in September. *CJS* 14591, *HFP* 863, 2001.

Peristylus goodyeroides (D. Don) Lindl., Gen. Sp. Orch. 299. 1835; Gamble, Fl. Madras 1475(1030). 1928; Sant. & Kap., Orch. Bombay 52. 1966. *Habenaria goodyeroides* D. Don, Prodr. Fl. Nepal. 25. 1825; King & Pantling, Ann. Roy. Bot. Gard. (Calcutta) 8: 326, t. 430. 1898.

Robust. Leaves 3-5, spirally arranged at about middle of stem. Flowers small, creamy-white; lateral sepals mucronate; lip 3-lobed.

Indomalaya. In partial shade of thickets in wet deciduous to semi-evergreen forests (600-900 m). August-September. *CJS* 10928, *HFP* 2008-A.

Note: Very similar to *P. plantagineus* from which it differs by the arrangement of leaves, shape of sepals and lip. These characters need further study for constancy.

Peristylus secundus (Lindl.) Rathak., Indian Forester 98: 31. 1972; *Coeloglossum secundum* Lindl., Gen. Sp. Orch. 303. 1835. *Peristylus lancifolius* A. Richard, Ann. Sci. Nat. Bot. ser. 2, 15: 69, t. 2C. 1841; Gamble, Fl. Madras 1475(1030). 1928. *Peristylus robustior* Wight, Ic. t. 1699. 1851. *Habenaria robustior* (Wight) J. Hooker, Fl. Brit. India 6: 160. 1890.

Stem to 25 cm. Leaves 5-7, with sheathing bases. Bracts conspicuous. Flowers greenish-yellow; lip with short midlobe and longer, arching lateral lobes.

S. India. Rare, collected on grassy slopes of Shiradi Ghat (600 m) in September 1969.

Peristylus spiralis A. Richard, Ann. Sc. Nat. Bot. ser. 2, 15: 69, t. 2B. 1841; Wight, Ic. t. 1696. 1851; Gamble, Fl. Madras 1474(1030).

1928; Sant. & Kap., Orch. Bombay 49. 1966. *Habenaria torta* J. Hooker, Fl. Brit. India 6: 159. 1890.

Slender. Leaves 3-5, toward base of stem. Bracts not conspicuous. Lateral lobes of lip smaller than midlobe.

S. India, Sri Lanka. In open or partially shaded grasslands in upper Ghats (600-900 m). August-October. *CJS* 17810, *HFP* 752.

PHALAENOPSIS Blume

Epiphytes. Stem short; leaves 2-5, flat, crowded at base. Inflorescence lateral, racemose. Sepals and petals free, spreading, more or less alike. Lip shortly saccate, not spurred at base, clawed, articulated on column-foot, 3-lobed; lateral lobes rounded or obovate, basally lobed on inner side, midlobe usually narrowed and variously awned at base (antennae). Anther 2-celled; pollinia 2, subglobose, cleft; caudicle with prominent gland.

1 Leaves undulate; lip forming short mentum; lateral lobes of lip without terminal fossae ..... *P. decumbens*

1 Leaves entire; lip not forming mentum; lateral lobes of lip with terminal fossae.... ..... *P. mysorensis*

Phalaenopsis decumbens (Griffith) Holttum, Gard. Bull. Straits Settlem. 11: 286. 1947; Seidenfaden & Smitin., Orch. Thailand 544. t. 404. 1963. *Aerides decumbens* Griffith, Notul. Pl. As. 3: 365. 1851. *Phalaenopsis wightii* Reich. f., Bot. Zeit. 214. 1862. *Doritis wightii* (Reich. f.) Bentham, Gen. Pl. 3: 574. 1883. *Kingiella decumbens* (Griff.) Rolfe, Orch. Rev. 25: 197. 1917; Gamble, Fl. Madras 1439 (1006). 1928. *Kingidium decumbens* (Griff.) P. Hunt, Kew Bull. 24: 97. 1970.

Leaves obovate, wavy on margin. Lip forming short mentum with column-foot; lateral lobes pink with arched connivent appendages on inside; midlobe with 2 antennae from basal callus.

Indomalaysia. Rare. On trees in upper and lower Ghats. April-May. *CJS* 14496, *HFP* 2785.

Phalaenopsis mysorensis Saldanha, Indian Forester 100: 571, t. 3. 1974.

Leaves flat, elliptic-obovate, bifid at apex. Flowers white. Lip articulated on yellow column-foot, not forming mentum; lateral lobes with basal inner lobe and fossae at anterior apex; midlobe with raised sides and triangular central depression; callosities 2, arching over base of median depression; antennae 4, 2 very short and 2 longer. Capsule elliptic-oblong, to 5 cm long.

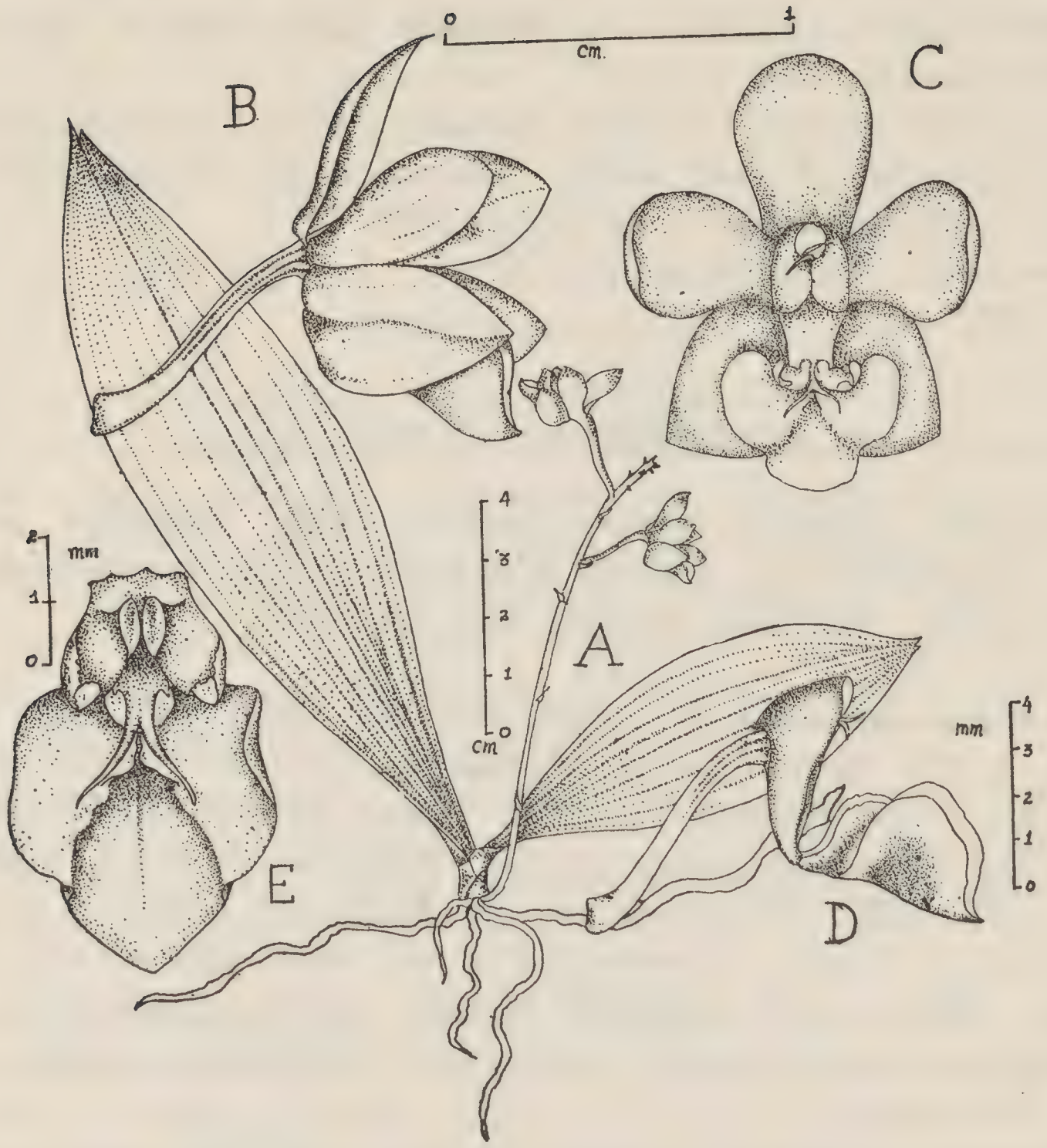


Fig. 128. *Phalaenopsis mysorensis*: *A*, habit; *B*, *C*, flower; *D*, column with lip; *E*, lip.

Locally common on forest trees at Vanagur-Banagere. Flowers December; fruits to May. *CJS* 15915; *HFP* 1581.

PHOLIDOTA Lindley

Epiphytes with an ovoid or conical, uninodal, pseudobulb terminated by 1-2 leaves. Inflorescence terminal, racemose, many-flowered. Flowers hidden in imbricating bracts. Laterals sepals concave, boat-shaped, keeled, acute; dorsal broadly ovate, rounded. Petals narrower linear, free. Lip deeply concave, saccate at base, 3-lobed with prominent, thickenings on the inside. Column short, broadly winged. Anther 2-celled. Pollinia 4, in two pairs, shortly attached to a membrane.

Pholidota pallida Lindl., Bot. Reg. sub t. 1777. 1836; Summerhayes, Rep. Third World Orch. Conf. 311. 1960. *Pholidota imbricata* sensu

Lindl., Bot. Reg. t. 1213. non Lindl. in Hooker, Exot. Fl. t. 138. 1825; Gamble, Fl. Madras 1430(1000). 1928; Sant. & Kap., Orch. Bombay 175. 1966.

Pseudobulbs clustered. Leaves broadly elliptic. Raceme drooping. Bracts persistent. Flowers white. Lateral sepals winged on keel; lip 3-lobed; midlobe 2-lobulate, its sinus straight.

Indomalaysia. Common in upper Ghats. July-September. *CJS* 10350, 12483, *HFP* 440.

PLATANTHERA L. C. Rich. *nom. cons.*

Terrestrial, tuberous. Leaves cauline, sessile, sheathing at base. Inflorescence terminal. Pollinia 2, elongated, powdery; caudicles long with viscidia. Stigmatic surfaces flat, confluent.

Platanthera susannae (L.) Lindl., Gen. Sp. Orch. 295. 1835; Wight, Ic. t. 920. 1845; Gamble, Fl. Madras 1475(1031). 1928; Sant. & Kap., Orch. Bombay 42. 1966. *Orchis susannae* L., Sp. Pl. 939. 1753. *Habenaria susannae* (L.) R. Brown ex Sprengel, Syst. Veg. 3: 622. 1826. *Pecteilis susannae* (L.) Rafin., Fl. Tellur. 2: 37. 1836.

Robust, to 125 cm. Flowers 6×7.5 cm, white suffused with green, scented. Dorsal sepal rhomboid; laterals twisted. Petals linear. Lip with fimbriate lateral lobes and narrow entire midlobe; spur narrow, much longer than ovary.

Indomalaysia. Scattered on grassy slopes or under light cover on Ghats. September-October. *CJS* 15160, *HFP* 934.

Note: Often included in *Habenaria* or in *Pecteilis.*

POLYSTACHYA W. J. Hooker *nom. cons.*

Epiphytes with 2-3 noded pseudobulbs, sometimes caulescent. Leaves coriaceous. Inflorescence terminal; scape simple or with many spikes, sheathing. Flowers pedicellate. Sepals subequal; the dorsal free; the laterals connate with column-foot to form a wide mentum; petals linear, apiculate, smaller. Lip sessile at tip of column-foot, 3-lobed; column short, fleshy. Anther 1-2-celled; pollinia 2, globular, with a short, broad caudicle.

Polystachya flavescens (Blume) J. J. Smith, Fl. Buitenz. 6: 284, f. 218. 1905; Sant. & Kap., Orch. Bombay 186. 1966. *Onychium flavescens* Bl., Bijdr. 325. 1825. *Polystachya purpurea* Wight, Ic. t. 1679. 1851. *Polystachya wightii* Reichb. in Walp., Ann. 6: 640. 1861; Gamble, Fl. Madras 1437(1005). 1928.

Leaves 3-4. Inflorescence simple or branched. Flowers yellow, not resupinate. Lateral sepals broadly and obliquely ovate-triangular. Lateral lobes of lip small, narrow, triangular, acute; midlobe broadly oblong, deflexed at tip, covered with mealy, loose, round cells.

Indomalaysia. Common in upper Ghats. July-August. *CJS* 14572, *HFP* 482.

PORPAX Lindley

Epiphytes with depressed, subrotund pseudobulbs, covered by reticulate, lace-like sheaths. Leaves 2, deciduous or not. Flowers 1-3, terminal or lateral, subsessile. Sepals connate, tubular or only the laterals fused. Petals free, dissimilar to sepals, linear, subfalcate, included in the calyx tube, inserted on the dorsal side of column. Lip fleshy, entire or 3-lobed, sometimes indistinctly, weakly articulated on the foot of column. Stamen 1; anther 2-celled. Pollinia 8, pyriform, cohering in 4s to a common membrane.

1 Leafless in flower. Sepals all connate into a tube, glabrous on the outside. Lip 3-lobed, basally with a solitary, erect tooth.....*P. reticulata*

1 Leafy in flower. Sepals only lateral, connate, setulose on the outside. Lip obscurely 3-lobed, without an erect tooth at the base.....*P. jerdoniana*

Porpax jerdoniana (Wight) Rolfe, Orchid Rev. 16: 18. 1908; Gamble, Fl. Madras 1422(995). 1928; Sant. & Kap., Orch. Bombay 158. 1966. *Lichenora jerdoniana* Wight, Ic. t. 1748. 1851.

Leaves ovate, yellowish-brown, blotched. Flowers 1-3, terminal, light brown. Sepals connate only in the lower half; dorsal sepal free in the upper half; laterals united, boat-shaped, brownish-tomentose outside. Lip included in sepals, small.

South W. India. Occasional in upper Ghats at Hettur and abundant on wet tree trunks, 3 m from ground, in middle Bisle Ghat. August-October. *CJS* 14596, *HFP* 2006.

Porpax reticulata Lindl., Bot. Reg. 31. 1845; Gamble, Fl. Madras 1422(994). 1928; Sant. & Kap., Orch. Bombay 157. 1966. *Aggeianthus marchantioides* Wight, Ic. t. 1737. 1851.

Pseudobulbs aggregated. Leaves obovate, green, deciduous. Flower solitary, lateral, brick-red. Lip glabrous outside, papillose inside, 3-lobed, panduriform; hypochile with prominent tooth.

South W. India. Common in upper Ghats. April-August. *CJS* 13362, *HFP* 545. (Plate 18).

RHYNCHOSTYLIS Blume *emend.* Hasskarl

Epiphytes. Stem simple or branched. Leaves closely approximate,

articulate, lorate. Inflorescence lateral, racemose, densely flowered, erect or pendulous. Flowers showy, of medium size, resupinate. Sepals and petals free, spreading, more or less alike; lateral sepals decurrent on column-foot. Lip immobile, entire, on column-foot, spurred. Spur laterally much compressed, without calli. Column short with a very short column-foot. Anther beaked, 2-celled; pollinia 2, globular, indented, attached to a long thin, apically spatulate caudicle.

Rhynchostylis retusa (L.) Blume, Bijdr. 286, t. 49. 1825; Gamble, Fl. Madras 1440(1007). 1928; Sant. & Kap., Orch. Bombay 211. 1966. *Epidendrum retusum* L., Sp. Pl. 953. 1753.

Leaves irregularly notched at apex. Sepals, petals white, dotted with pink. Lip pink; spur laterally compressed, pubescent inside; epichile spreading, emarginate.

Indomalaysia. Common in Ghats. May-June. *CJS* 13579, *HFP* 2797.

SARCANTHUS Lindley

Epiphytic with short or long stem. Leaves articulate, flat or terete, coriaceous or fleshy, pointed. Inflorescence lateral, on nodes, perforating leaf sheath, racemose. Flowers small. Sepals and petals alike, free. Lip immobile, spurred, 3-lobed; lateral lobes near mouth of spur, acute, adnate to column or foot; midlobe erect, triangular; disc fleshy. Spur with calli at mouth and median longitudinal septum toward tip. Column short; column-foot short or none. Anther 2-celled; pollinia 4, in pairs, attached to narrow or apically broad stipe.

Sarcanthus pauciflorus Wight, Ic. t. 1747. 1851. *Sarcanthus peninsularis* Dalzell, Hooker's J. Bot. Kew. Gard. Misc. 3: 343. 1851; Gamble, Fl. Madras 1447(1012). 1928; Sant. & Kap., Orch. Bombay 230. 1966.

Pendulous epiphytes. Leaves fleshy, linear, notched and acuminate at tip. Raceme simple, opposite leaves. Sepals and petals yellowish, with red margins. Lip white, lateral lobes of lip minute, acute; midlobe triangular acute with a pair of calli between lateral lobes; spur slightly arched.

India, Sri Lanka. Common in lower Ghats. Flowers June-July; fruits to April. *CJS* 14443, *HFP* 249.

Note: Sarcanthus pauciflorus Wight was published in May 1851. *S. peninsularis* Dalz. was published after July 1851 as the death of Ledebour on July 4, 1851 is reported in *Hooker's J. Bot. Kew Gard. Misc.* 3: 283. 1851.

SATYRIUM Swartz *nom. cons.*

Terrestrial; roots tuberous. Leaves sessile, sheathing. Inflorescence a

terminal spike. Flowers not resupinate; lip posterior with double spur. Column arched, without foot. Anther 2-celled; pollinia 2, with distinct caudicles and viscidia.

Satyrium nepalense D. Don, Prodr. Fl. Nepal. 26. 1825; Gamble, Fl. Madras 1476(1032). 1928.

Flowers pink; lip cupular, crenulate; spur arched on either side of ovary; pollinia subreniform with prominent, cordate viscidia. Capsule elliptic, strongly ribbed, to 1 cm long.

India, Indochina. Common on grassy slopes of Genkalbetta (1250 m) toward end of monsoon. September-November. *HFP* 1170.

SCHOENORCHIS Blume

Epiphytes. Stem elongated, drooping or short, thick. Leaves articulate. Inflorescence racemose or paniculate. Flowers resupinate. Sepals and petals free; lip 3-lobed; lateral lobes often obscure; midlobe fleshy, often arched and ending in a knob; spur rounded, thick-walled without distinct calli. Anther 2-celled; pollinia 4, in 2 pairs, with common stipe and gland.

Schoenorchis latifolia (C. Fischer) Saldanha, J. Bombay Nat. Hist. Soc. 70: 415. 1974. *Rhynchostylis latifolia* C. Fischer, Bull. Misc. Inform. 358. 1927; Gamble, Fl. Madras 1440(1007). 1928.

Stem short. Leaves imbricate, coriaceous, unequally bilobed at apex. Flower small, bluish-purple. Lip fleshy, obscurely 3-lobed, arched, ending in a fleshy knob; spur white, rounded, glabrous inside. Rostellar arms prolonged. Capsule ovate, ribbed, to 5 mm.

S. India. Fischer's type is from Kadamane in Hassan District. Common on trees in upper Ghats. July-September. *CJS* 14420, *HFP* 438.

SIRHOOKERA O. Kuntze

Epiphytes. Stem very short. Leaves coriaceous. Inflorescence a panicle of racemes; axis and branches persisting to flower several times. Flowers small, not spurred. Sepals subequal, the dorsal hooded. Petals narrower. Lip adnate to the base of column, concave, 3-lobed; sidelobes incurving, acute; midlobe smaller, with a basal callus uniting sidelobes; column shortly winged upward, without a foot. Anther 2-celled; pollinia 4, clavate, in pairs, sessile on gland.

1 Epichile obtuse, deflexed at right angles to the hypochile.....*S. lanceolata*
1 Epichile concave, more or less boat-shaped, erect and continuous with the hypochile.. .....*S. latifolia*

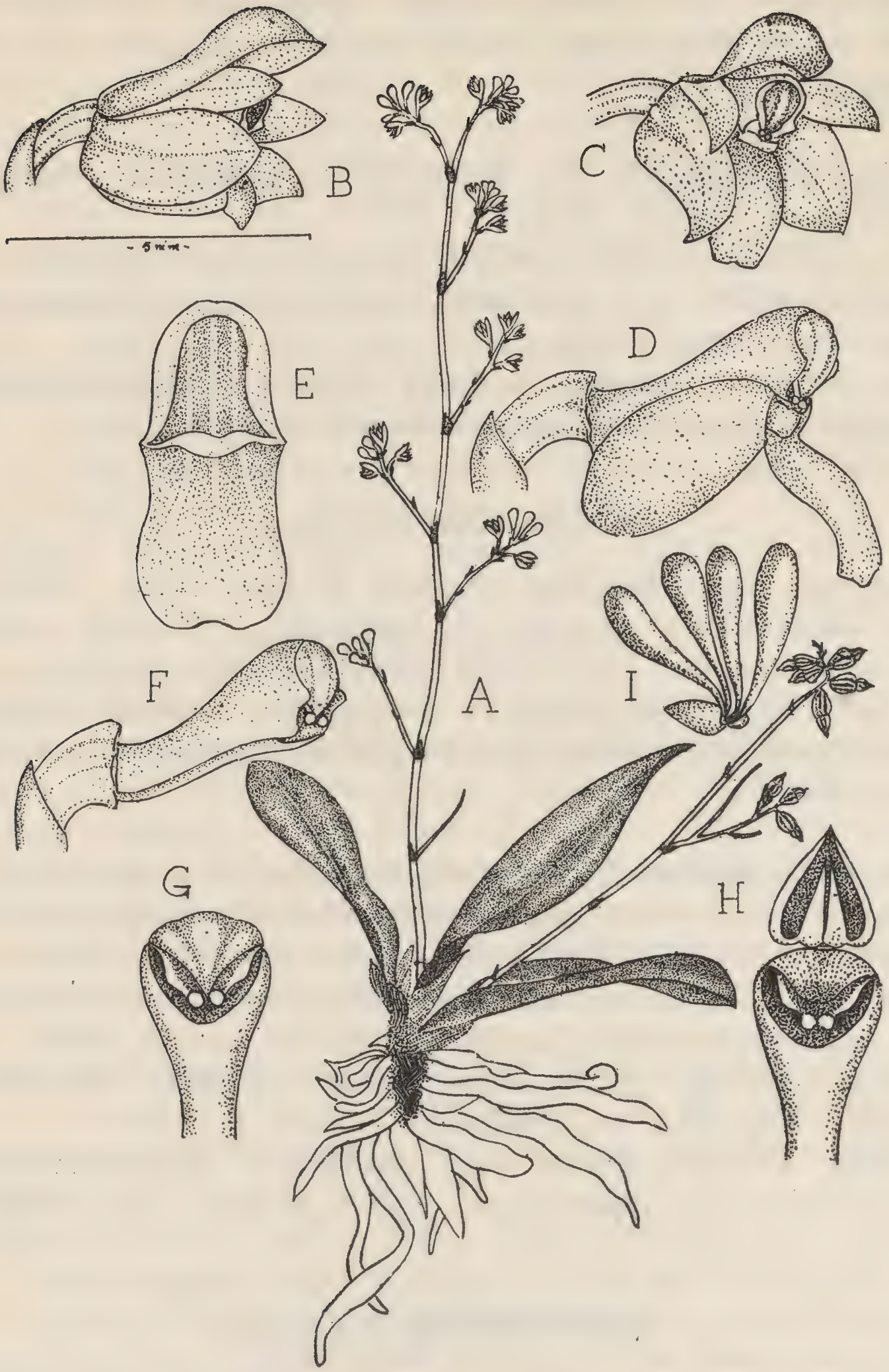


Fig. 129. *Sirhookera lanceolata*: *A*, habit; *B*, *C*, flowers; *D*, column with lip; *E*, lip; *F*, column; *G-H*, column with anther cap; *I*, pollina.

Sirhookera lanceolata (Wight) Kuntze, Rev. Gen. Pl. 681. 1891; Sant. & Kap., Orch. Bombay 163. 1966. *Josephia lanceolata* Wight, Ic. t. 1742. 1851; Gamble, Fl. Madras 1428(999). 1928.

To 12 cms tall. Flowers 3-4 mm. Sepals and petals white. Lip white, slightly saccate at base; epichile at right angles to hypochile, subquadrate-rectangular. Column and anther cap tinged with purple.

South W. India. Common on trees of semi-evergreen forests of upper Ghats (Devalkere). Flowers in August; fruiting October. *CJS* 14497, 15478.

Sirhookera latifolia (Wight) Kuntze, Rev. Gen. Pl. 681. 1891. *Josephia latifolia* Wight, Ic. t. 1743. 1851; Gamble, Fl. Madras 1428(999). 1928.

To 30 cms. Flower 3-4 mm. Petals and sepals yellowish-green;

Fig. 130. *Sirhookera latifolia*: *A*, habit; *B*, *C*, flowers; *D*, column with lip; *E*, column; *F*, *G*, lip; *H*, pollinia.

lip boat-shaped; epichile continuous with hypochile, narrowed to acute point, with submarginal purple markings. Column and anther cap white.

South W. India. Common on trees of semi-evergreen forests of upper Ghats (Hanbal-Devalkere). July-September. *CJS* 14238, 14467, *HFP* 562.

Note: Several authors have questioned the validity of these 2 species. Others have suggested that the flowers in Wight's illustrations have been interchanged. A study of the type material and of colored copies of Wight's illustrations (K.) leaves no doubt about the identity of our plants. Our specimens tally perfectly with the original material as regards shape and color of flowers.

SMITHSONIA Saldanha

Epiphytes. Stem short; leaves approximate, retuse at tip. Inflorescence of lateral, few-many-flowered racemes. Flowers large or small, resupinate. Sepals and petals not much differing, spreading. Lip sessile on column, immobile, spurred, 3-lobed; lateral lobes small, erect; midlobe below rim of lip, triangular, curved, entire, more or less covering spur. Spur pointed, usually bent forward, with no constrictions or calli. Column short; column-foot none. Anther 2-celled; pollinia 2, deeply furrowed into unequal lobes. Caudicle slender, with a bifid gland at tip.

1 Inflorescence longer than the leaves; spur hairy inside.....*S. maculata*
1 Inflorescence shorter than the leaves; spur glabrous inside.
2 Midlobe of lip overhanging spur completely, prolonged into triangular, acute, lateral wings; flowers greenish-white, 1-1.5 cm wide.....*S. viridiflora*
2 Midlobe of lip not overhanging spur completely; lateral wings short, obtuse. Flowers straw-colored, spotted with red, 0.5 cm wide.....*S. straminea*

Smithsonia maculata (Dalzell) Saldanha, J. Bombay Nat. Hist. Soc. 71: 74. 1974. *Micropera maculata* Dalzell, Hooker's J. Bot. Kew Gard. Misc. 3: 282. 1851. *Gastrochilus maculatus* (Dalzell) O. Kuntze, Rev. Gen. Pl. 2: 661. 1891; Sant. & Kap., Orch. Bombay 227. 1966.

The largest of the species. Racemes long, many flowered. Sepals, petals yellow with red spot in the center. Lip white; midlobe transverse, half-way down spur, completely covering it; inside of spur hairy.

Western Karnataka. Common in Ghats. March-September. *HFP* 407, 2856.

Smithsonia straminea Saldanha, J. Bombay Nat. Hist. Soc. 71: 73. 1974.

Racemes 1-2, few-flowered. Sepals, petals yellow with red spots; lip white with pink spur; midlobe with short lateral wings, not covering spur completely.

Common in upper Ghats. April-June. *CJS* 13361, *HFP* 1608.

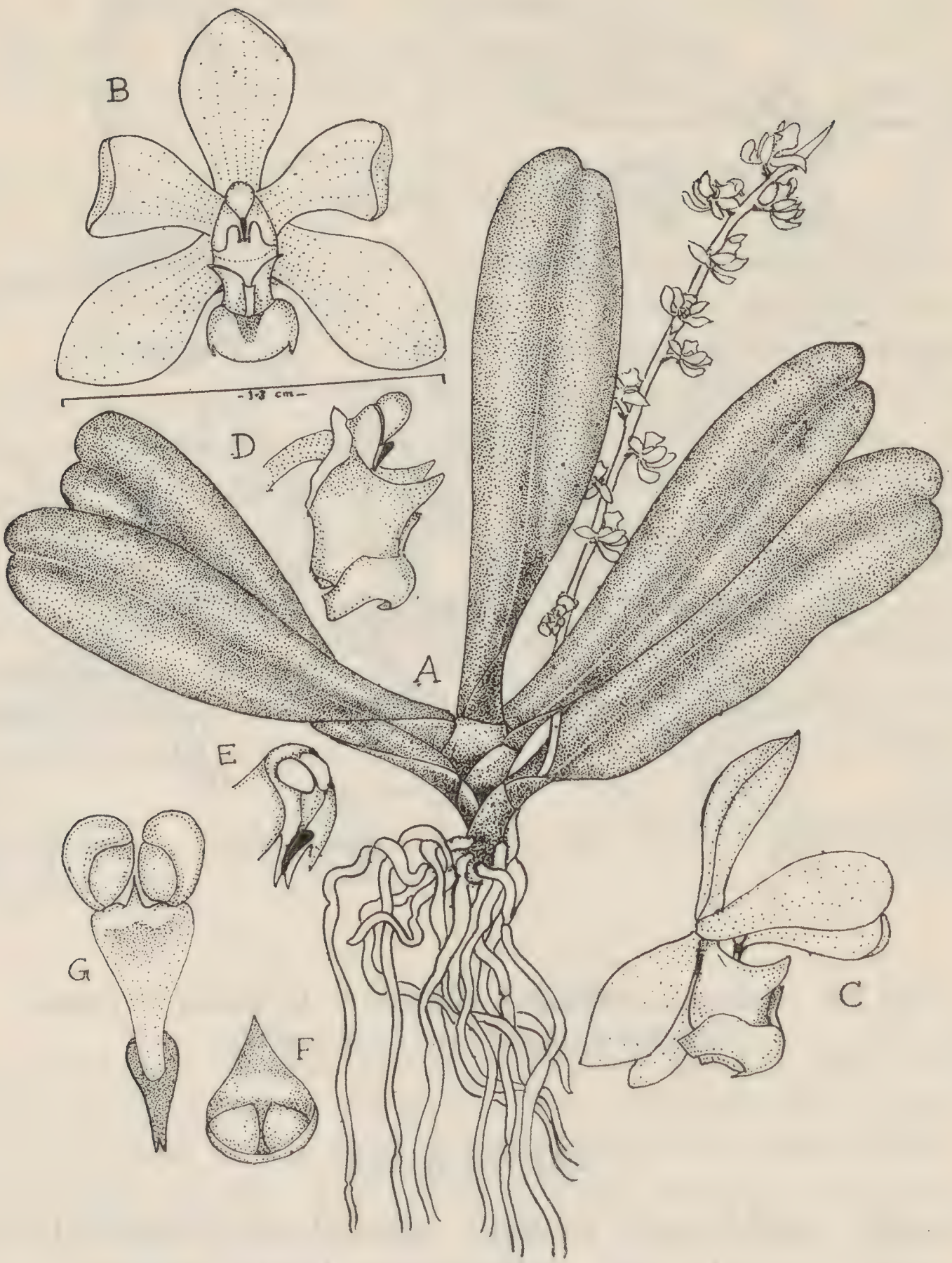


Fig. 131. *Smithsonia maculata*: *A,* habit; *B, C,* flower; *D,* column with lip; *E,* column; *F,* operculum; *G,* pollinia.

Smithsonia viridiflora (Dalzell) Saldanha, J. Bomb. Nat. Hist. Soc. 71: 75. 1974. *Micropera viridiflora* Dalzell, Hooker's J. Bot. Kew Gard. Misc. 3: 282. 1851. *Sarcochilus dalzellianus* Sant., Kew Bull. 498. 1949. *Gastrochilus dalzellianus* (Sant.) Sant. & Kap., J. Bombay Nat. Hist. Soc. 59: 842, t. 52A. 1963; Orch. Bombay 228. 1966.

Sepals, petals greenish-white; lip white with pink dots; midlobe triangular with pointed lateral wings completely covering the white spur.

North Kanara, now Hassan. Rare, collected only once at Kempuhole, in lower Shiradi Ghat. March. *HFP* 1498.

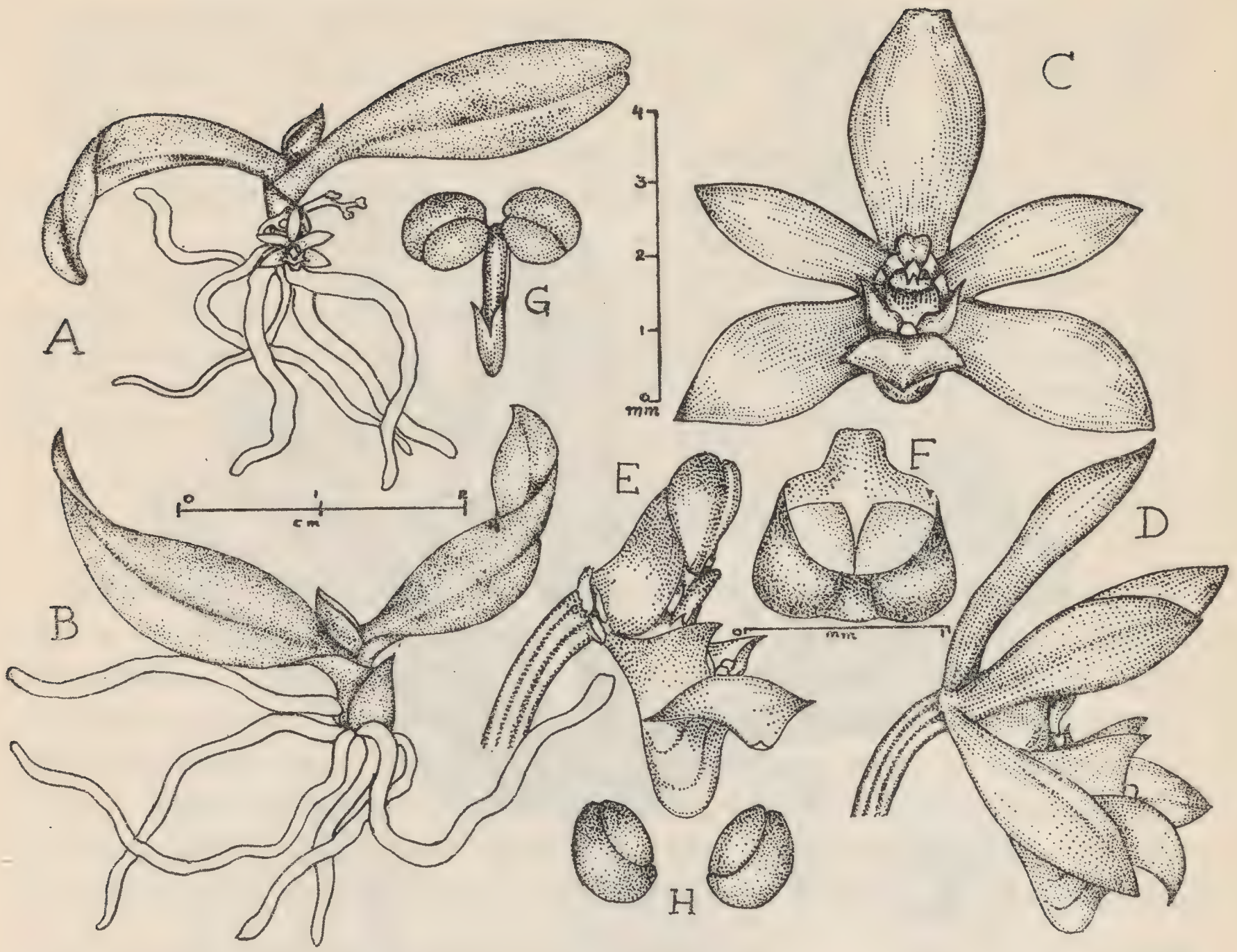


Fig. 132. *Smithsonia straminea*: *A, B,* habit; *C, D,* flowers; *E,* column with lip; *F,* operculum; *G, H,* pollinia.

TAINIA Blume

Terrestrial orchids with fusiform, exposed, pseudobulbs terminated by a solitary, plicate leaf. Inflorescence lateral, racemose. Flowers resupinate. Sepals free, the laterals forming a short mentum with the short column-foot; petals similar to sepals. Lip usually 3-lobed, sessile on column-foot, saccate or not at base. Column elongate, flat, entire, more or less hooded at tip. Anther 2-celled. Pollinia 4-8 or united by viscus.

Tainia bicornis (Lindl.) Reichb. f., Bonplandia 5: 54. 1857; Gamble, Fl. Madras 1427(998). 1928; Seidenfaden & Smitin., Orch. Thailand 743, t. 553. 1965. *Ania bicornis* Lindl., Edward's Bot. Reg. 28: 37. 1842; Wight, Ic. t. 914. 1844-45.

Leaf coriaceous; petiole articulate with pseudobulb. Sepals and petals linear, green. Lip 3-lobed; side lobes short with red striations; midlobe slightly expanding, emarginate, yellow; disc with 3 fleshy lamellae. Column spotted with red. Horns of anther cap red. Pollinia 8.

South W. India, Sri Lanka. Occasional in upper Ghats (Yettinahalla and Banagere). In shade, on loose, sandy soil. January-February. *CJS* 15953, 16181, *HFP* 2581.

THUNIA Reichenbach

Epiphytes. Stem long, with acuminate, membranous, plaited, articulate leaves. Inflorescence terminal, racemose, noding, few-many-flowered. Flowers large, resupinate, with spathaceous bracts. Sepals and petals similar, free, oblong-lanceolate; lip with a short, obtuse or emarginate spur; lateral lobes rolled around base of column; midlobe large, expanded, crispate or fimbriate; column slender, winged near apex; anther 2-celled; pollinia 8, attached in 2 sets of 4 each to a membrane.

Thunia venosa Rolfe, Orchid Rev. 13: 206. 1905; Gamble, Fl. Madras 1427(908). 1928; Sant. & Kap., Orch. Bombay 184. 1966.

Inflorescence few-flowered; sepals, petals white; midlobe of lip with longitudinal ridges, slightly fimbriate, hairy on the inside, with purple striae.

India, Burma. Fairly common in upper Ghats. July-August. *CJS* 14239, *HFP* 2890.

TRIAS Lindley

Epiphytes with slender, creeping rhizome bearing pseudobulbs terminated by a solitary, coriaceous leaf. Inflorescence lateral, few-flowered. Dorsal sepals free; laterals adnate to column-foot; petals smaller, linear, oblong. Lip mobile, clawed, articulate with tip of foot, fleshy, spatulate. Column with apiculate wings at tip. Anther long-beaked; pollinia 4, in two pairs, globular.

Trias stocksii Bentham ex J. Hooker, Fl. Brit. India 5: 781. 1890; Sant. & Kap., Orch. Bombay 200. 1966.

Pseudobulbs globose. Leaf elliptic, acute. Flowers orange with numerous red dots. Lip deep chocolate.

South W. India. Common in upper Ghats. January-April. *CJS* 11525, 16222, *HFP* 1324.

Note: Taxon overlooked by Gamble.

VANDA R. Brown

Epiphytes. Leaves usually channeled, articulate, incised at tip. Inflorescence axillary, racemose, simple or branched, few-many-flowered.

Flowers usually large, resupinate. Sepals and petals more or less similar, widely spreading from a narrowed base. Lip immobile, saccate or spurred at base; side lobes large or small; midlobe large; disc fleshy with longitudinal ridges; column short; foot short. Pollinia 2-4, furrowed to deeply 2-partite, borne on short, broad stipes; gland large.

1 Flower 4-5 cm; sepals and petals brown tessellated on the inside; lip white..*V. tessellata*
1 Flower 1 cm; sepals and petals yellow, not tessellated; lip dotted with pink..*V. testacea*

Vanda tessellata (Roxb.) Hooker ex G. Don in Loud., Hort. Brit. 372. 1830; Gamble, Fl. Madras 1445 (1010). 1928; Sant. & Kap., Orch. Bombay 220. 1966. *Epidendrum tessellatum* Roxb., Pl. Cor. t. 42. 1795.

Epiphytes. Flowers large, 4-5 cm. Sepals, petals brown tessellated on the inside. Lip with a conical, pointed spur; side-lobes ovate-acute, white; midlobe large, white with 2 fleshy longitudinal ridges; spur slightly yellowish and pubescent on the inside.

India, Sri Lanka. Frequent in upper Ghats. Flowers in September-October; fruits to March. *CJS* 11305, *HFP* 654.

Vanda testacea (Lindl.) Reichb. f., Gard. Chron. 2: 166. 1877; Sant. & Kap., Orch. Bombay 219. 1966. *Aerides testaceum* Lindl., Gen. Sp. Orch. 238. 1835. *Vanda parviflora* Lindl., Bot. Reg. 30: Misc. 45. 1844; Wight, Ic. t. 1669. 1851; Gamble, Fl. Madras 1444 (1010). 1928.

Epiphytes. Flowers small, yellow; lip spotted with pink, with conical pointed spur; disc of midlobe with fleshy ridges.

India, Sri Lanka. Common in upper Ghats. April. *CJS* 10341, *HFP* 2757.

ZEUXINE Lindley *nom. cons.*

Rhizomatous, perennial, slender herbs, with membranous, often achlorophyllous leaves. Inflorescence a terminal erect spike. Sepals subequal; laterals free; dorsal adnate with the petals forming a hood. Lip saccate at base, clawed, emarginate or bilobed apically. Column short, without foot, often with appendages near apex. Pollinia 2, lammellate or pyriform, attached to a short or long caudicle. Stigmatic surfaces 2, prominent.

1 Lobules of lip orbicular, entire.....*Z. gracilis*
1 Lobules of lip oblique, irregularly toothed.....*Z. longilabris*

Zeuxine gracilis (Breda) Blume, Fl. Java N. S. 56, t. 18, f. 2, t. 23D. 1858; Sant. & Kap., Orch. Bombay 171. 1966. *Psychechilos gracile*

Breda, Gen. Sp. Orch. t. 9. 1827. *Zeuxine blatteri* Fischer, Bull. Misc. Inform. 76. 1928; Fl. Madras 1456 (1018). 1928.

Flower 5 mm, yellow. Sac of lip with a pair of recurved spurs; limb white, reddish near claw.

Indomalaysia. Common in upper Ghats, in partially shaded localities with plenty of humus and leaf litter. February-April. *CJS* 13356, *HFP* 2624.

Note: Santapau and Kapadia have reduced *Z. blatteri* to synonymy under *Z. gracilis*. Fischer, however, states that the 2 recurved spurs within the sac-like hypochile are absent in his plant (Gamble, *Fl. Madras* 1456 (1018). 1928).

Zeuxine longilabris (Lindl.) Bentham ex J. Hooker, Fl. Brit. India 6: 107. 1890; Gamble, Fl. Madras 1456 (1018). 1928; Sant. & Kap., Orch. Bombay 169. 1966. *Monochilus longilabre* Lindl., Gen. Sp. Orch. 487. 1840. *Monochilus affine* Wight, Ic. t. 1728. 1851 non Lindl.

Flowers 1.6 cm long. Sac of lip with 2 spurs on the inside; limb large, white, toothed.

India, Sri Lanka. Common in upper Ghats on soft soil covered by humus. December-April. *CJS* 16292, *HFP* 1383.

APPENDIX

The treatment of the Ferns and Fern Allies did not reach our hands in time for inclusion, due to conditions beyond our control. However, the following materials were received and we felt they should be published. We regret not having the treatments and keys to the other taxa of these interesting plants.

EDITORS

THELYPTERIDACEAE

R. E. Holttum

Ground ferns with a radially symmetric, erect or creeping rhizome bearing basifixed scales and spirally arranged fronds. Stipe with paired bundles fused distally and U-shaped in cross section; abscission layer absent. Lamina (simple), pinnate or decompound, usually pinnate-pinnatifid with a membrane in the sinus between adjacent pinna-lobes, pubescent with acicular unicellular hairs at least on upper surface of rachis and on costae* of pinnae; hairs and glands on lower surfaces more varied. Venation free or reticulate. Fronds uniform. Sori on lower surface, indusiate and punctate or (secondarily) exindusiate and punctate, linear or confluent. Spores monolete (trilete in *Trigonospora ciliata*), conspicuous perispore present or not.

1 Veins free.
2 Fronds bipinnate to tripinnate.....**Macrothelypteris**
2 Fronds pinnate-pinnatifid.
3 Reduced pinnae present at base of frond; spores monolete with many small wings .....**Pseudocyclosorus**
3 No reduced pinnae; spores trilete, with minute tubercles.....**Trigonospora**
1 Veins anastomosing.
4 Fronds irregularly proliferous from bases of pinnae; forked hairs present on rachis; sori exindusiate.....**Ampelopteris**
4 Fronds not bearing branches; forked hairs lacking; sori indusiate.
5 Pinnae lobed not more than 1/3 toward costa; 3 pairs of veins anastomosing+2-3 pairs to sides of sinus-membrane.....**Pronephrium**
5 Pinnae in most cases more deeply lobed; fewer veins anastomosing; sinus-membrane shorter.
6 Small pale glandular hairs abundant on lower surface of veins, largest towards apices of veins on the pinna-lobes.....**Amphineuron**
6 Glandular hairs, if present, sparse, uniform, in most cases lacking.....**Christella**

AMPELOPTERIS Kunze

Fronds pinnate, proliferating irregularly by branches arising at bases of pinnae; forked unicellular hairs present on rachis; sori exindusiate; sporangia lacking glands near annulus, but glandular cells present at ends of hairs on sporangium-stalks.

* In pinnate-pinnatifid species the terms costa and costule are applied to the midrib of the pinna and its lobes respectively.

Ampelopteris prolifera (Retz.) Copel., Gen. Fil. 144. 1947; Holttum, Rev. Fl. Malaya 2: 298. 1955. *Hemionitis prolifera* Retz., Obs. Bot. 6: 38. 1791. *Meniscium proliferum* (Retz.) Sw., Syn. Fil. 19: 207. 1806. *Goniopteris prolifera* (Retz.) Presl, Tent. Pterid. 183. 1836; Bedd., Ferns S. India 57, t. 172. 1863; Handb. Ferns Brit. India 297. 1883.

Ampelopteris elegans Kunze, Bot. Zeit. (Berlin) 6: 114. 1848.

Rhizome creeping with closely seriate fronds; apical growth of fronds indefinite, upper pinnae smaller than lower ones, lowest largest; very short forked unicellular hairs present in groove of upper surface of rachis; largest pinnae to 20×2 cm, short-stalked, edges crenate to sub-entire; venation bipinnate, veins to 12 pairs, almost all anastomosing and forming zig-zag composite veins alternating with costules, sinus-membranes very short; lower surface of pinnae hairless, bearing scattered small ± orbicular ciliate scales when young, similar scales covering buds at bases of some pinnae. Sori a little elongate along veins; spherical cells (ends of hairs on stalks of sporangia) conspicuous in young sori.

Paleotropics. Fairly common along open banks of streams in lower Ghats. October. *HFP* 925.

Note: The forked unicellular hairs resemble those of the New World genus *Goniopteris*; no other Old World member of the family has this character. The small forked hairs on the rachis are hardly large enough to be detected by use of a hand-lens and are often rubbed off old specimens.

(Prof. Holttum informs us that the *Ferns of Malaya* was actually sold in 1955, although an unbound copy was given to him in 1954 Oct.—Editors.)

AMPHINEURON Holttum

Fronds pinnate with rather deeply lobed pinnae; basal pinnae usually unreduced but a few irregular very small pinnae sometimes present at base of frond; basal veins free, or one pair anastomosing (both conditions sometimes present in the same frond); lower surface of veins (in some species also between veins) usually bearing very small glandular hairs; sori in most cases indusiate, indusia often bearing glandular hairs; sporangia lacking hairs or glands near annulus; sporangium-stalk with hair bearing a terminal glandular cell; spores dark, bearing irregular coarse broad ridges, not thin wings.

Amphineuron terminans (Hooker) Holttum, Amer. Fern J. 63: 82. 1973. *Nephrodium terminans* Hooker, Spec. Fil. 4: 73. 1862; Bedd., Ferns S. India 32, t. 90. 1863.

Aspidium pteroides sensu Sw., J. Bot (Schrader) 2: 33. 1801. *Nephrodium pteroides* sensu J. Sm., Cat. Cult. Ferns 54: 1857; Baker, Syn. Fil. 289. 1867, p.p.; Bedd., Handb. Ferns Brit. India 269. 1883.

Dryopteris pteroides C. Chr., Ind. Fil. 287. 1905, p.p. not *Polypodium pteroides* Retz.

Dryopteris interrupta sensu Ching, Lingnan Sci. J. 12: 566. 1933. *Cyclosorus interruptus* Ching, Bull. Fan Mem. Inst. Biol. 8: 184. 1938; Holttum, Rev. Fl. Malaya 2: 262, t. 149. 1955 (not *Pteris interrupta* Willd.)

Thelypteris wagneri Fosb. & Sachet, Smithsonian Contrib. Bot. 8: 6: 1972.

Rhizome long-creeping, 5 mm diameter; stipes to 50 cm or more long, short-hairy with narrow scales near base; frond to 80 cm long with up to 25 pairs pinnae with rather abrupt transition to almost pinna-like apical lamina, at base 1-2 pairs of irregularly placed very small pinnae sometimes present. Pinnae commonly to 20×1.5-2 cm, sometimes to 30 cm long, acuminate, lobed 1/3 toward costa or more deeply; costules 4-5 mm apart, at c. 60° to costa; veins 6-9 pairs, one pair uniting to form an excurrent vein to the sinus-membrane, one or two other veins to sides of membrane; lower surface bearing short acicular hairs on rachis, costae and costules, on veins abundant small globular to pear-shaped glandular hairs, larger toward apices of veins, pale to yellow; upper surface antrorse-hairy on costa with a few short hairs on costules. Sori close to margins of pinna-lobes, not on lower veins; indusium sometimes bearing short acicular hairs; spherical yellow glandular cell at apex of hair on sporangium-stalk.

Tropical Asia & Malaysia to New Guinea. Common in shade in upper Ghats. October. *HFP* 813, 993.

Note: There has been much confusion in names applied to this species, first because Swartz misinterpreted *Polypodium pteroides* Retz. (which is a species of *Tectaria*), and then because Ching misinterpreted *Pteris interrupta* Willd. (which is the earliest name for the species described as *Cyclosorus gongylodes* (Schk.) Link in Holttum's *Ferns of Malaya*). According to ICBN *Dryopteris interrupta* (Willd.) Ching and *Cyclosorus interruptus* (Willd.) Ching were new names for Willdenow's species though the plants described by Ching under these names represent a species different from Willdenow's type.

CHRISTELLA Leveille

Rhizome creeping or erect; fronds pinnate, pinnae more or less deeply pinnatifid, a few pairs of lower pinnae in most species gradually reduced but not to a very small size; aerophores not dilated; in most species 1-2 pairs of veins anastomosing (veins usually all free in a section of the genus in Africa and America); both surfaces of fronds usually bearing many acicular hairs, sometimes elongate unicellular glandular hairs, not sessile spherical glands; sori indusiate; sporangia bearing elongate unicellular glandular hairs on their stalks, no gland nor hair near annulus; spores about as in *Amphineuron*.

Note: About 50 species, throughout the tropics and subtropics, with greatest abundance in N. E. India and Burma. Widely distributed species are mostly tetraploid and adapted to more or less open positions, not too deep shade; they are often variable so that they are difficult to classify, needing experimental study to show their inter-relationships. Experimental studies of a few species have been published by Panigrahi & Manton (J. Linn. Soc., Bot. 55: 729-743. 1958) and Ghatak & Manton (Brit. Fern. Gaz., 10: 183-192. 1971).

1 Lowest pinnae not smaller than next pair above them.....*C. parasitica*
2 Copious hairs 1 mm long on lower surface generally; elongate orange glands on lower surface of veins; rhizome long-creeping.....*typical form*
2 Hairs on lower surfaces all much shorter; no orange glands; rhizome short, suberect .....*atypical form*
1 Lower pinnae, 2-3 pairs, gradually reduced and more widely spaced.
3 Rhizome short-creeping; pinnae lobed more than 1/2 way to costa.....*C. dentata*
3 Rhizome long-creeping; pinnae lobed less than 1/2 way to costa.....*C. meeboldii*

Christella dentata (Forsk.) Brownsey & Jermy, Brit. Fern Gaz. 10: 338. 1973. *Polypodium dentatum* Forsk., Fl. Aegypt.-Arab. 185. 1775. *Thelypteris dentata* (Forsk.) E. St. John, Amer. Fern J. 26: 44. 1936; A. R. Smith, Univ. Cal. Publ. Bot 59: 57. 1971. *Cyclosorus dentatus* (Forsk.) Ching, Bull. Fan Mem. Inst. Biol. 8: 206. 1938.

Nephrodium molle sensu Hooker, Spec. Fil. 4: 67. 1862, p.p.; Bedd., Ferns S. India 29, 1863 p.p., Handb. Ferns Brit. India 277. 1883, p.p., Suppl. 76. 1892, p.p., not *Polypodium molle* Jacq.

Cyclosorus subpubescens sensu Holttum, Rev. Fl. Malaya 2: 273, 624, t. 157. 1955 not *Aspidium subpubescens* Bl.

Rhizome short-creeping; stipes to 50 cm long; lamina to 90 cm long, lower 2-4 pairs on pinnae gradually smaller and more widely spaced with enlarged crenate basal acroscopic lobes; largest pinnae to 15×2.2 cm acuminate, lobed a little more than half way to costa; costules 3½-4 mm apart, slightly oblique; veins 8-9 pairs, lowest pair anastomosing with excurrent vein to sinus, one or both of next pair to sides of sinus-membrane; lower surface of rachis and costae bearing short erect hairs, shorter hairs on costules, veins and surface, no glandular hairs; upper surface with scattered long hairs on costules and veins, also minute hairs between veins. Sori medial or a little supramedial; indusium short-hairy.

Paleotropics, naturalized in parts of Neotropics. Fairly common in partial shade in upper Ghats. July-October.

Note: A variable species; specimens in exposed places may be considerably smaller than above described; number and spacing of lower reduced pinnae is to some extent dependent on nature of surrounding plants.

Christella meeboldii (Rosenst.) Holttum, *comb. nov. Dryopteris meeboldii* Rosenst., Feddes Repert. 12: 247. 1913. *Thelypteris meeboldii* (Rosenst.) Reed, Phytologia 17: 291. 1968.

Nephrodium procurrens sensu Bedd., Handb. Ferns Brit. India 278. 1883, p.p., not suppl. 67. 1892.

Cyclosorus jaculosus sensu Panigrahi & Manton, J. Linn. Soc., Bot. 55: 729, t. 1. 1958.

Rhizome long-creeping, 3-4 mm diameter when dry; stipe to 25 cm long (sterile) to 45 cm (fertile), glabrescent; lamina to 50 cm long, basal 2-3 pairs pinnae gradually reduced, apparently less strongly auricled than in *C. dentata*; pinnae of sterile fronds often wider than fertile and a little less deeply lobed; large pinnae c. 11 × 1.5 cm, acuminate, lobed less than half way to costa; costules 3-4 mm apart; veins 5-7 pairs, 1-1½ pairs anastomosing, next pair to sides of sinus-membrane; hairs on lower surface all very short, no glandular hairs; minute hairs between veins of upper surface. Sori medial or a little supramedial; indusia short-hairy.

S. India, Sri Lanka. Common in partial shade in Ghats. February-October. *CJS* 16189, *HFP* 814, 893.

Note: *Cyclosorus jaculosus* (Chr.) H. Ito was based on a specimen from Taiwan which also has a slender creeping rhizome, but its pinnae are less deeply lobed, veins more numerous and some glandular hairs are present on the lower surface. It seems preferable to use Rosenstock's name, based on a S. Indian specimen. This species needs more critical local study to demonstrate clearly its differences from *C. dentata*. *Nephrodium malabariense* Fee, also based on a S. Indian type (lacking rhizome) has somewhat more deeply lobed pinnae, lower surface minutely hairy with some glandular hairs.

Christella parasitica (L.) Lev., Fl. Kouy-tcheou 475. 1915; Holttum, Taxon 20: 533. 1971. *Polypodium parasiticum* L., Sp. Pl. 1090. 1753. *Dryopteris parasitica* (L.) O. Kuntze, Rev. Gen. Pl. 811. 1891; C. Chr., Ark. Bot. 9, no. 11: 26, t. 4. 1910. *Cyclosorus parasiticus* (L.) Farwell, Amer. Midl. Naturalist 12: 259. 1931; Holttum, Rev. Fl. Malaya 2: 281, t. 162. 1955. *Thelypteris parasitica* (L.) Tard., Notul. Syst. (Paris) 7: 75. 1938.

Nephrodium didymosorum Parish ex Bedd., Ferns Brit. India t. 200. 1866. *Nephrodium molle* var. *didymosorum* Bedd., Handb. Ferns Brit. India 279. 1883. *Dryopteris didymosora* C. Chr., Ind. Fil. 262. 1905.

Nephrodium tectum Wall. ex Bedd., Handb. Suppl. 79. 1892, p.p., excl. *King* 8657 from Perak (wrongly cited as 8757).

Aspidium procurrens Mett., Ann. Mus. Bot. Lugduno-Batavium 1: 231. 1864. *Nephrodium procurrens* (Mett.) Bak., Syn. Fil. 290. 1867, not sensu Bedd., Hand. Suppl. 67. 1892 which mainly refers to *N. parasiticum* var. *aureum* Clarke=*Dryopteris cylindrothrix* Rosenst.

Rhizome suberect to long-creeping; basal pinnae of frond not reduced, somewhat narrowed to their bases which are slightly auricled on acroscopic side; pinnae lobed about 2/3-3/4 toward costa; basal veins uniting to form a short excurrent vein running to sinus-membrane, next veins passing to edge. Sori a little supramedial, indusia short-hairy.

Typical form of species. Rhizome long-creeping; stipes to 50 cm or more long; lamina to c. 45 cm long; pinnae to c. 12 × 2 cm, acuminate; lower surfaces throughout bearing slender spreading acicular hairs to 1 mm

long, also many elongate orange glandular hairs on veins; sori on adjacent basal veins often contiguous, sometimes no other sori present.

Mainland tropical Asia, S. Japan, Malaysia, Pacific islands. Frequent in upper Ghats. September-October. *HFP* 660.

Note: Apparently more abundant in the more seasonal climates. The type of *A. procurrens* Mett., from Java, lacks glands on the lower surface but otherwise agrees. In Singapore, where this fern is not common, plants appear to have a shorter rhizome and fewer glands than South Indian specimens. King's collection 8657 from Perak (cited by Beddome under *N. tectum*) which has a quite erect rhizome, represents another species.

Atypical form, differing from type as follows. Rhizome suberect to erect; hairs on both surfaces fewer and much shorter; no glandular hairs on lower surface.

This appears to be the common local fern of the species in the area of Hassan Flora. More field study is needed. A specimen from the Palni Hills has a slender rhizome and glands on the lower surface of the veins, but very short hairs on lower surfaces as in the atypical specimens of the Hassan Flora. *HFP* 959, 960.

MACROTHELYPTERIS (H. Ito) Ching

Rhizome suberect or short-creeping; scales narrow, ± thickened at base, with marginal and superficial acicular and capitate hairs; fronds bipinnate to tripinnate with adnate ultimate segments; scales on fronds, if present, narrow, hair-tipped, with thickened base and sometimes setose edges; hairs on frond acicular and capitate, some long septate acicular hairs always present; sori small, with or without a small indusium; sporangia usually bearing capitate hairs near annulus.

1 Rachises and lower surfaces of axes of pinnules lacking scales; sori with small indusia ..... *M. torresiana*

1 Rachises and lower surfaces of axes of pinnules bearing narrow scales thickened at their bases; no indusia ..... *M. ornata*

Macrothelypteris ornata (Wall. ex Bedd.) Ching, Acta Phytotax. Sin. 8: 309. 1963; Holttum, Blumea 17: 30. 1969. *Polypodium ornatum* Wall. ex Bedd., Ferns S. India 56. t. 171. 1864; Clarke, Trans. Linn. Soc. London, Bot. ser. 2, 1. 545. 1880; Hope, J. Bombay Nat. Hist. Soc. 15: 81. 1903. *Phegopteris ornata* J. Sm., Hist. Fil. 233. 1875; Bedd., Handb. Ferns Brit. India 294. 1883. *Thelypteris ornata* Ching, Bull. Fan Mem. Inst. Biol. 6: 346. 1936.

Nephrodium tenericaule Hooker, Spec. Fil. 4: t. 269. 1862, excluding description and most synonyms.

Rhizome short-creeping; frond with stipe to 4.5 m tall (Beddome); stipe at first scaly almost throughout, densely so toward base, later warty from thick persistent bases of scales, scales thin, when fresh, pale,

drying light brown; rachises more sparsely scaly, scales much smaller than those on stipe, narrow with thickened base, lacking marginal hairs. Frond ovate to oblong in outline. tripinnate-pinnatifid; largest pinnae c. 65×25 cm, pinna-rachises pale, bearing scattered narrow scales 3 mm long; pinnules to c. 15×3 cm; segments of third order well spaced along pinnules but adnate to a wing along pinnule-axis, deeply lobed; midribs of pinnules and segments beneath showing a transition from very narrow scales with thickened bases to pale, stiff, slender, uniseriate hairs. Sori small, exindusiate; sporangia bearing short capitate hairs.

Eastern Himalayas, Assam, N. Burma, S. India. Occasional in forest undergrowth in upper Ghats. August. *HFP* 402.

Note: Beddome adopted Wallich's unpublished name given to specimens from North India, but he based his description on his own specimen from Wynaad Hills which should rank as type.

Macrothelypteris torresiana (Gaud.) Ching, Acta Phytotax. Sin. 8: 310. 1963; Holttum, Blumea 17: 27. 1969. *Polystichum torresianum* Gaud. in Freyc., Voy. Bot. 333. 1824. *Thelypteris torresiana* (Gaud.) Alston, Lilloa 30: 111. 1960. (Type: Gaudichaud, Mariana Isl.)

Aspidium uliginosum Kunze, Linnaea 20: 6. 1847. *Dryopteris uliginosa* (Kunze) C. Chr., Ind. Fil. Suppl. 3, 100. 1934. *Thelypteris uliginosa* (Kunze) Ching, Bull. Fan Mem. Inst. Biol. 6: 342. 1936; Holttum, Rev. Fl. Malaya 2: 241. 1955 (Type: Cult. Hort. Bot. Leipzig, Origin Java).

Polypodium tenericaule Hooker, J. Bot. Kew Gard. Misc. 9: 353. 1857. *Lastrea tenericaulis* (Hooker) Moore, Ind. Fil. 99. 1858; Bedd., Handb. Ferns Brit. India 266. 1883. *Nephrodium tenericaule* (Hooker) Hooker, Spec. Fil. 4: 142. 1862 p.p., excl. t. 269. (Type: Alexander, China).

Lastrea flaccida sensu Bedd., Ferns S. India 35, t. 99. 1863 not *Aspidium flaccidum* Bl.

Lastrea setigera (Bl.) Hooker & Baker, Syn. Fil. 284. 1867, p. p.

Rhizome short-creeping; stipes to 50 cm long, glaucous, swollen and fleshy base covered with narrow dark brown scales, rest smooth, glabrescent. Lamina to c. 70×50 cm, ovate in outline, bipinnate-pinnatifid, with 12-15 pairs of free pinnae; pinnae to 30×12 cm, pinnate with all but lowest pinnules ±adnate to pinna-rachis; pinnules to 8×2.5 cm, cut almost to midrib into oblique dentate to deeply lobed segments, largest segments to 12×3 mm; midribs of pinnules and segments beneath bearing pale stiff slender hairs to 1.5 mm long, longest hairs consisting of several cells; no scales present on frond. Sori small; indusia very small, bearing a few capitate hairs; sporangia each with 2-3 short capitate hairs.

Paleotropics & subtropics; naturalized in some Neotropics (Florida). Fairly common in partial shade in upper Ghats. September-October. *HFP* 953, 976.

Note: This species was much confused with *Macrothelypteris setigera* (Bl.) Ching, which is confined to Malaysia, by many authors until Ching's publication of 1936. Beddome stated that he could not see indusia; they are usually present, but are hidden by the ripe sporangia and careful examination is necessary to see them.

PRONEPHRIUM Presl

Fronds simply pinnate, basal pinnae not or little reduced; pinnae shallowly lobed; several pairs of veins anastomosing; spherical glandular hairs sometimes present on surfaces of pinnae and on sporangia; sori indusiate or exindusiate, spores of most species with a continuous wing and a few cross-wings, in the Indian species here described with many very small wings.

Note: In *Blumea* 19: 34-37. 1971 and 20: 105-126. 1972, this genus is divided by Holttum into three sections. The species described below is the only Indian species of sect. *Dimorphopteris*; the other two sections are both represented by species in other parts of Southern India. The genus as a whole comprises about 60 species, the majority in Malaysia.

Pronephrium articulatum (Houlst. & Moore) Holttum, Blumea 20: 116. 1972. *Nephrodium articulatum* Houlst. & Moore, Gard. Mag. Bot. 293. 1851.

Nephrodium abruptum sensu Bedd., Ferns S. India 31. t. 86. 1863, not *Aspidium abruptum* Bl.

Nephrodium glandulosum (Bl.) var. *laete-strigosa* Clarke, Trans. Linn. Soc. London, Bot. ser. 2, 1: 532, t. 74, fig. 2. 1880. *Cyclosorus laete-strigosus* (Clarke) Ching, Bull. Fan Mem. Inst. Biol. 8: 227. 1938. *Thelypteris laete-strigosa* (Clarke) Iwatsuki, Fl. Eastern Himal. 484. 1966.

Nephrodium pennigerum sensu Bedd., Handb. Ferns Brit. India 277. 1883 as regards Indian plants only; Suppl. 73. 1892 excl. var. *malayense*.

Dryopteris indica van Ald. van Ros., Handb. Mal. Ferns 224. 1908. *Thelypteris indica* (van Ald. van Ros.) Reed, Phytologia 17: 284. 1968.

Rhizome short, erect; stipe to 70 cm or more long, short-hairy, when young bearing short ovate thin scales at base; lamina to 80 cm long, sterile often larger than fertile, with c. 20 pairs pinnae, a few apical pairs gradually reduced, grading into deeply lobed acuminate frond-apex; basal pinnae cuneate at their bases, those above them with successively broader bases; largest sterile pinnae to c. 20 × 3 cm, fertile to c. 15 × 2.3 cm, base truncate, apex rather abruptly caudate-acuminate, edges lobed 1/4-1/3 toward costa; costules 4.5-5.5 mm apart, at 60° to costa; veins to 10 pairs anastomosing, next 2-3 pairs passing to sides of sinus-membrane; lower surface bearing short spreading hairs on rachis and costae, shorter appressed hairs on costules, scattered spherical yellow glands between veins; upper surface

bearing ±abundant slender appressed hairs and scattered spherical glands between veins. Sori medial, lower ones supramedial; indusia large, glabrous; sporangia lacking glands near annulus but an ellipsoid terminal glandular cell sometimes present at end of hair on stalk of sporangium; spores bearing numerous very small wings.

S. India, Sri Lanka, Bangladesh, Burma southward to Moulmein. Common in partial shade near forest streams in upper Ghats. April. *HFP* 1518.

Note: In dealing with this species, Beddome was misled by Hooker, who confused it with a Malaysian fern which has normal pinnae of similar shape but also many much-reduced pinnae at the base of the frond; this fern was first called *Nephrodium abruptum* and later *pennigerum* by Hooker, who (under *N. pennigerum*) copied Blume's description of a plant in Java (it is named *Cyclosorus megaphyllus* (Mett.) Ching in Holttum's *Ferns of Malaya*. Beddome discovered Hooker's second mistake after publishing the Handbook, and unsuccessfully attempted to correct it in the Supplement. Van Alderwerelt's name *Dryopteris indica* was an attempt (before Ching's) to correct Beddome. The earliest name, *Nephrodium articulatum*, was given to a plant sent from Ceylon in 1845 and cultivated at Kew, but Hooker evidently did not know of it, though his Curator John Smith listed it among ferns cultivated at Kew in 1857.

PSEUDOCYCLOSORUS Ching

Rhizome erect or short-creeping, scales broad, thin, almost hairless. Fronds pinnate-pinnatifid with abrupt or subabrupt transition at base to numerous reduced pinnae; acrophores at bases of pinnae ±swollen, white and conspicuous on young living fronds; veins free, basal acroscopic vein of each group passing to side of a short membrane in the sinus between two pinna-lobes, basal basiscopic vein passing to edge above base of sinus; lower surfaces with indumentum of acicular and short capitate hairs, variously distributed; sori indusiate; sporangia lacking glands or hairs near annulus, usually with a hair of 3 cells on stalk; spores bearing many small isodiametric wings.

Pseudocyclosorus ochthodes (Kunze) Holttum, *comb. nov.* *Aspidium ochthodes* Kunze, Linnaea 24: 282. 1851. *Lastrea ochthodes* (Kunze) Moore, Ind. Fil. 98. 1958; Bedd., Ferns S. India 37, t. 106. 1863; Handb. Ferns Brit. India 240. 1883, p.p., excl. var. *tylodes*. *Dryopteris ochthodes* (Kunze) C. Chr., Ind. Fil. 280. 1905 p.p. & Suppl. 3, 93. 1934 (not *D. ochthodes* sensu van Ald. van Ros., Handb. Mal. Ferns 215. 1908). *Thelypteris ochthodes* (Kunze) Ching, Bull. Fan Mem. Inst. Biol. 6: 300. 1936.

Nephrodium prolixum sensu Baker, Syn. Fil. 268. 1867, p.p.; sensu Clarke, Trans. Linn. Soc. London, Bot. ser. 2, 1: 516. 1880, p.p., not *Aspidium prolixum* Willd.

Rhizome suberect or short-creeping; stipe c. 10 cm long to first reduced pinna, base of stipe to first large pinna upto 50 cm or more on large fronds;

lowest reduced pinnae 5 mm long or less, upper ones gradually larger with lobed edges and auriculate at acroscopic base, transition to large pinnae subabrupt; aerophores at bases of pinnae broad and swollen but little elongate. Fronds varying much in size, largest (excluding reduced pinnae) c. 80 cm long; largest pinnae to 16×2 cm, lower ones auricled at acroscopic base, all lobed to 1 mm from costa; veins in lobes to c. 12 pairs; lower surface of rachis, costae and costules bearing rather sparse stiff pale hairs 1 mm long, shorter hairs distally on costules and sometimes between veins, short capitate hairs usually lacking. Sori supramedial; indusia glabrous or bearing a few acicular hairs or short capitate hairs.

S. India. Common in partially shaded, moist places in upper Ghats. August-November. *CJS* 15440, *HFP* 666.

Note: Specimens reported from northern India appear all to be *P. repens* (Hope) Ching, but specimens from all parts of India need more study; they show differences in aerophores, pubescence of lower surfaces, shape of reduced pinnae and position of sori. Beddome states that this species occurs in Malaya, but I have seen no Malayan specimens, and do not know upon what evidence he made the statement.

TRIGONOSPORA Holttum

Rhizome short, erect; fronds pinnate-pinnatifid, lowest pinnae not or little reduced; aerophores not or little swollen; pinnae deeply lobed; veins free (except in one species in Burma), basal acroscopic vein of each group passing to the side of a short membrane in the sinus between two pinna-lobes, basal basiscopic vein passing to edge above base of sinus; pubescence of acicular hairs on lower surface of pinnae variable. Sori medial or inframedial, indusiate; sporangia lacking glands or hairs near annulus, hair on sporangium-stalk consisting of several cells with glandular terminal cell; spores trilete with minute superficial papillae.

Note: Probably 8-10 species, which have not yet all been clearly distinguished. The genus occurs from Sri Lanka and S. India to N. E. India and S. China, Malaya, Sumatra, Java, Celebes.

Trigonospora ciliata (Benth.) Holttum, Blumea 19: 29. 1971. *Aspidium ciliatum* Bentham, Fl. Hongkong 455. 1861. *Lastrea calcarata* sensu Bedd., Handb. Ferns Brit. India 235. 1883, p.p., not *Aspidium calcaratum* Bl. of Java & Sumatra.

var. **angustiloba** Holttum, *var. nov.*

Lastrea falciloba sensu Bedd., Ferns S. India 37, t. 105. 1863, not *Nephrodium falcilobum* Hooker.

Lastrea calcarata var. *ciliata* sensu Bedd., Handb. Ferns Brit. India 235. 1883, p.p.

Lastrea cana sensu Ching, Bull. Fan Mem. Inst. Biol. 6: 291. 1936,

not *L. cana* J. Sm. nor *L. cana* sensu Bedd., Ferns Brit. India t. 307. 1869.

A varietate typica speciei differt: frondibus multo majoribus; pinnis acuminatis, inferioribus basi auriculatis; lobis pinnarum valde obliquis.

Type of variety: Jarrett & Ramamoorthy *HFP* 1054, stream between Devalkere and Devarunde.

Stipes of largest fronds 40 cm long, short-hairy throughout, scaly near base; lamina to 35 cm long, narrowly elliptic in outline, pinnae to 20 pairs; basal pinnae often slightly shorter than next, narrowed toward base on basiscopic side, less so on acroscopic side; sub-basal pinnae to 11.5×2.5 cm (on some plants to 7×1.5 cm), lobed to 1.5-2 mm from costa, basal acroscopic lobe elongate and close to rachis, other lobes oblique at an angle little more than 45° to costa; veins to 10 pairs (7 pairs on smaller specimens); slender and not prominent; lower surface of rachis and costae bearing rather sparse stiff spreading pale hairs about 1 mm long, a few shorter hairs on costules; upper surface with pale antrorse hairs on costa short near base and longer distally, scattered short hairs on costules. Sori near costules; a few hairs on indusia.

India to S. China, southwards to north of Malaya and of Sumatra; of variety: S. India, Assam. In moist, shaded places in Ghats. October-December.

Index to Families, Genera and Species

Italicized numbers indicate illustrations
Italicized names indicate synonymy

Abelmoschus Medic. 148
esculentus (L.) Moench 16
ficulneus (L.) Wt. 148
manihot (L.) Medic. 148
moschatus Medic. 148, 149
Abildgardia Vahl 680
eragrostis Nees 678
ovata (Burm.) Kral 679
Abrus Adanson 233, 235
precatorius L. 235
pulchellus Thw. 235, 236
Abutilon Miller 146, 149
glaucum (Cav.) Sweet 150
indicum (L.) Sweet 149
muticum (DC.) Sweet 150
pannosum (Forst.) Schlecht. 149
persicum (Burm.) Merr. *30*, 149, 150
polyandrum (Roxb.) W. & A. 150
Acacia Miller 225
arabica auct. 228
arrophula Don 227
caesia auct. 229
chundra (Rottl.) Willd. 226
concinna (Willd.) DC. 228
farnesiana (L.) Willd. 226
ferruginea DC. 226, 227
leucophloea (Roxb.) Willd. 226, 227
megaladena Desr. 226, 227
nilotica (L.) Del. 226, 227
pennata (L.) 226, 227, 228
polyacantha Willd. 226, 228
rugata Benth. 228, 229
rugata (Lam.) Merr. 228, 229
sinuata (Lour.) Merr. *49*, 226, 228
suma (Roxb.) Voigt 228
torta (Roxb.) Craib 225, 229
Acalypha L. 329, 330
malabarica Muell. 330
ACANTHACEAE 25, 538
Acanthephippium Bl. 810, 812
bicolor Lindl. 812
Acanthospermum Schr. 598, 599
hispidum DC. 599
Acanthus maderaspatensis L. 545
repens Vahl 545
Achyranthes L. 102
aspera L. *19*, 102
bidentata Bl. 102, 104
corymbosa L. 99
lanata L. 104
repens L. 106
Aclisia Mey. 641
indica Wt. 641
secundiflora (Bl.) Bakh. f. 641
Acrantherum pumilum Rich. 711
Acrocephalus Benth. 496, 497
indicus (Burm.) Kuntze 497
Acronychia J. & G. Forst. 381
laurifolia Bl. 381
pedunculata (L.) Miq. *75*, 381
Actiniopteris radiata (Sw.) Link 12
Actinodaphne Nees 43, 45
hirsuta Hk. 45
leiantha (Kurz) Hk. 45
malabarica Balak. 45
Adelia nereifolia Roth 342
resinosa Blanco 344
Adenia Forsk. 168
hondala (Gaert.) de Wilde 168
palmata (Lam.) Engl. 168

Adenoon Dalzell 598, 599
indicum Dalz. 15, *104*, 600
Adenostemma J. & G. Forst. 597, 600
latifolium Don 600
lavenia (L.) Kuntze 600
macrophyllum (Bl.) DC. 600
Adhatoda Miller 540
nilgherrensis Nees 552
vasica Nees 540
wynaadensis Nees 552
zeylanica Medic. 540
Adina Salisb. 571, 572
cordifolia (Roxb.) Bran. 572
Aegiceras minus Gaert. 363
Aeginetia L. 532
indica L. *98*, 532
Aegle Corr. 381, 382
marmelos (L.) Corr. *75*, 382
Aerides Lour. 811, 812
crispum Lindl. 13, 812
cylindricum Lindl. 812
decumbens Griff. 842
lindleyana Wt. 812
maculosum Lindl. *122*, 812, 813
testaceum Lindl. 854
Aerva Forsk. 102, 104
lanata (L.) Juss. 104
monsoniae (L. f.) Mart. 104
Aeschynanthus Jack. 528
perrottetii DC. 13, *97*, 528
Aeschynomene L. 234, 236
aspera L. 236
indica L. 236
Aganosma Don 429
cymosa (Roxb.) Don *86*, 429
AGAVACEAE 18, 21, 801
Agave L. 801, 802
americana L. 802
foetida L. 803
ingens Berg. 802
sisalana Engelm. *119*, 802
Ageratum L. 597, 600
conyzoides L. *104*, 601
houstonianum Mill. 601
Aggeianthus marchantioides Wt. 845
Aglaia Lour. 390, 392
anamallayana (Bedd.) Kosterm. *76*, 390, 392
elaeagnoidea (Juss.) Benth. 390, 392
lawii (Wt.) Sald. *76*, 392
maiae Bourd. 390, 392
polystachya Wall. 393
roxburghiana Miq. 392
Agrostis coromandeliana Retz. 754
diandra Retz. 754
fertilis Steud. 754
procera Retz. 731
Agrostistachys Dalz. 329, 330
indica Dalz. *67*, 331
Agyneja bacciformis (L.) Juss. 349
Aira indica L. 751
AIZOACEAE 23, 94
Albizia Duraz. 225, 229
amara (Roxb.) Boiv. 229, 230
chinensis (Osb.) Merr. 229, 230
lebbeck (L.) Willd. 229, 230
marginata (Lam.) Merr. 230
odoratissima (L.f.) Benth. 229, 230
stipulata (Roxb.) Boiv. 230
Alisma parnassiifolia L. 631
reniforme Don 631
ALISMATACEAE 21, 629
Allamanda cathartica L. 437
Allmania Wt. 102, 104
dichotoma (Roth) Wt. 105
nodiflora (L.) Wt. *19*, 105
Allophylus L. 365
cobbe (L.) Raeusch. 365
rheedii (Wt.) Radlk. 365
Alloteropsis Presl 706
cimicina (L.) Stapf 706, 707
semialata (R.Br.) Hitchco. *111*, 706, 707
Alocasia (Schott) G. Don 782, 783
fornicata (Roxb.) Schott 783
Aloe L. 793
perfoliata L. 793
vera (L.) Burm. 793
Alopecuro-veronica L. 500
Alpinia Roxb. 762
malaccensis (Burm.) Rosc. *113*, 762
neesana Grah. 769
nimmonii Grah. 768
Alseodaphne Nees 45
semecarpifolia Nees 45
Alsine prostrata Forsk. 99
Alsodeia bengalensis Wall. 167
zeylanica Thw. 167
Alstonia R. Br. 427, 429
scholaris (L.) R. Br. 14, *86*, 429
Alternanthera Forsk. 102, 105
paronychioides St. Hil. 105
pungens H. B. K. *19*, 105, 106
repens (L.) Link 106
sessilis (L.) R. Br. *19*, 105, 106

triandra Lam. 106
Alysicarpus Desv. 234, 237
bupleurifolius (L.) DC. 237
glumaceus (Vahl) DC. 237
monilifer (L.) DC. 237
rugosus (Willd.) DC. 237
AMARANTHACEAE 23, 101
Amaranthus L. 102, 106
gracilis Desf. 107
spinosus L. *19*, 106
viridis L. 106, 107
AMARYLLIDACEAE 18
Ambrosinia retrospiralis Roxb. 786
Ameletia indica DC. 274
Amischophacelus R. & K. 641, 642
axillaris (L.) R. & K. 642
cucullata (Roth) R. & K. 642
Ammannia L. 272
baccifera L. 272
densiflora R. & S. 274
leptopetala Bl. 274
rotundifolia Don 275
Amomum Roxb. 762
cannicarpum (Wt.) Baker 764
cardamomum L. 767
dealbatum Roxb. 764
hypoleucum Thw. 764
microstephanum Baker *113*, 764
montanum Koenig 769
Amoora lawii (Wt.) Bedd. 392
polystachya (Wall.) Craib 393
rohituka (Roxb.) W. & A. 393
Amorphophallus Dec. 781, 783
bulbifer (Roxb.) Bl. 783
campanulatus (Roxb.) Dec. 783
Ampelocissus Planch. 358
tomentosa (Roth) Planch. *70*, 358
Ampelopteris Kunze 857
elegans Kunze 858
prolifera (Retz.) Copel. 858
Amphineuron Holttum 857, 858
terminans (Hk.) Holttum 858
Amyris dentata Willd. 383
ANACARDIACEAE 26, 28, 30, 372
Anacardium L. 374
occidentale L. *74*, 374
Anagallis L. 205
arvensis L. *44*, 205
latifolia L. 205
pumila Sw. *44*, 205
Anamirta Coleb. 64
cocculus (L.) W. & A. 66
Anaphalis DC. 597, 601
lawii (Hk.) Gamble 601
oblonga DC. 601
Anchusa zeylanica Hornem. 480
ANCISTROCLADACEAE 26, 171
Ancistrocladus Wall. 171
hamatus (Vahl) Gilg 172
heyneanus Grah. 172
Andersonia rohituka Roxb. 393
Andrographis Nees 540, 541
alata (Vahl) Nees 541
lineata Nees 541
neesiana Wt. 542
serpyllifolia (Vahl) Wt. 11, 541, 542
Andropogon aciculatus Retz. 716
annulatus Forsk. 722
aristatus Poir. 722
caesius Hk. & A. 719
concanensis Hk. 713
contortus L. 734
courtallumensis Steud. 708
dulcis Burm. 672
flexuosus Steud. 719
foveolatus Delile 731
hackelii Hk. 716
huegelii Hackel 714
lancifolius Trin. 710
lawsonii Hk. 758
nardus L. 719
nervosus Willd. 752
quadrivalvis L. 755
rhizophorus Steud. 753
tridentatus Roxb. 739
trispicatus Schul. 732
tristachyus Roxb. 732
Aneilema R. Br. 641, 642
lanuginosum Clarke 648
latifolium Wt. 648
lineolatum Kunth 648
montanum (Wt.) Clarke 643
nudiflorum (L.) Wall. 648
ovalifolium (Wt.) Clarke 643
paniculatum Clarke 649
pauciflorum Wt. 649
scaberrimum (Bl.) Kunth 643
secundum Wt. 649
semiteres Dalz. 649
sinicum Lindl. 649
spiratum (L.) R. Br. 649
Anethum graveolens L. *83*, 418
sowa Roxb. 418
Angiopteris evecta (Forst.) Hoffm. 15

Ania bicornis Lindl. 852
Aniseia barlerioides Choisy 470
Anisochilus Wall. 496, 497
carnosus (L. f.) Wall. *93*, 497
Anisomeles R. Br. 496, 497
heyneana Benth. 498
indica (L.) Kuntze 498
malabarica (L.) R. Br. 498
ovata Aiton 498
Annona L. 34, 40
muricata L. 40
reticulata L. 40
squamosa L. 40
ANNONACEAE 27, 34
Anogeissus (DC.) G. & P. 292
latifolia (DC.) Bedd. 12, 16, *55*, 292
Anotis DC. 583
foetida (Dalz.) Hk. 583
quadrilocularis (Thw.) Hk. 583
Anthisteria tremula Steud. 756
Anthoxanthum indicum L. 748
Antidesma L. 330, 331
menasu Tul. *67*, 331
Apama Lam. 56
siliquosa Lam. *9*, 56
Apetalon minutum Wt. 822
Aphanamixis Bl. 390, 393
polystachya (Wall.) Parker 393
Aphyllorchis Bl. 810, 814
montana Reichb. f. 814
prainii Hk. 814
APIACEAE 26, 414
Apluda L. 705, 707
aristata L. 707
mutica L. 707
Apocopis Nees 705, 708
courtallumensis (Steud.) Henr. 708
wightii Thw. 708
APOCYNACEAE 25, 26, 427
Apocynum frutescens L. 435
Apodytes Meyer 324
acutifolia Rich. 324
beddomei Masters 324
benthamiana Wt. 324
dimidiata Arn. 13, 17, *65*, 324
Aponogeton L. f. 635
crispus auct. 635
echinatus Roxb. *106*, 635
undulatus Roxb. 635
APONOGETONACEAE 21, 635
Aporosa Bl. 330, 331
lindleyana (Wt.) Baill. 13, 310, 331
Aquilicia sambucina L. 356
ARACEAE 21, 781
Arachis fruticosa Retz. 265
hypogea L. 16
ARALIACEAE 26, 412
Ardisia Sw. 200
humilis auct. 202
solanacea Roxb. *43*, 202, 308, Pl. 3
Areca catechu L. 16, 777
dicksonii Roxb. 777
ARECACEAE 20, 773
Arenga Labill. 774
wightii Griff. 14, 774
Arethusa plicata Andr. 837
Argemone L. 71
mexicana L. 71
Argostemma Wall. 571, 572
calycinum Benn. 584
courtallense Arn. 572
verticillatum Wall. 572, 573
Argyreia Lour. 464
cuneata (Willd.) K.-G. 12, 464
elliptica (Roth) Choisy 464, 466
imbricata (Roth) S. & P. 464, 466
pilosa W. & A. *89*, 464, 466
pomacea (Roxb.) Choisy 464, 467
Ariopsis Nimmo 782, 784
peltata Nimmo 784
Arisaema Mart. 781, 784
flavum Sch. 783
leschenaultii Bl. 784, Pl. 10
neglectum Sch. 785
tortuosum (Wall.) Sch. 784, 785
Aristida L. 704, 708
adscensionis L. 708
depressa auct. 708
hystrix L. f. 708, 709
setacea Retz. 708, 709
Aristolochia L. 56
acuminata Roxb. 57
indica L. *9*, 56
lanceolata Wt. 56
tagala Cham. 56, 57
ARISTOLOCHIACEAE 23, 54
Artabotrys R. Br. 34, 35
zeylanicus Hk. & Th. *5*, 35
Artemesia L. 598, 601
indica auct. 602
maderaspatana L. 617
minima L. 606
nilagirica (Cl.) Pamp. 602
vulgaris L. 602

vulgaris auct. 602
Arthraxon Beauv. 705, 709
hispidus (Thunb.) Mak. 709
lancifolius (Trin.) Hochst. 709
meeboldii Stapf 709, 710
Arthrosolen Mey. 277
Artocarpus J. & G. Forst. 77
gomezianus Trec. 77
heterophyllus Lam. *15*, 77
hirsutus Lam. *15*, 14, 77, 78
integrifolius auct. 77
lakoocha auct. 77
Arum bulbiferum Roxb. 783
campanulatum Roxb. 783
curvatum Roxb. 785
esculentum L. 786
fornicatum Roxb. 783
guttatum Wall. 789
ovatum L. 787
pedatum Willd. 789
sessiliflorum Roxb. 789
tortuosum Wall. 785
viviparum Roxb. 788
Arundinella Raddi 704, 710
avenacea Thw. 738
ciliata (Roxb.) Miq. *111*, 710
fuscata auct. 711
holcoides auct. 710
nepalensis Trin. 710
pumila (Rich.) Steud. 710, 711
purpurea Steud. 710, 711
setosa Trin. 710, 711
Arundo bambos L. 712
karka Retz. 748
ASCLEPIADACEAE 25, 437
Asclepias L. 437, 439
acida Roxb. 451
annularis Roxb. 449
asthmatica L. f. 454
curassavica L. 439
daemia Forsk. 451
gigantea L. 440
laurifolia Roxb. 447
racemosa Roxb. 445
tenuissima Roxb. 455
volubilis L. f. 455
Ascopholis Fischer 657
gamblei Fischer 658
Asparagopsis javanica Kunth 795
Asparagus L. 792, 793
gonoclados Baker 793
racemosus Willd. 793, 795
Aspidium abruptum Bl. 864
calcaratum Bl. 866
ciliatum Benth. 866
flaccidum Bl. 863
ochthodes Kunze 865
procurrens Mett. 861, 862
prolixum Willd. 865
pteroides sensu Sw. 858
subpubescens Bl. 860
uliginosum Kunze 863
Aspidopterys Juss. 408
cordata Wall. *80*, 408
ASTERACEAE 24, 595
Asteracantha longifolia (L.) Nees 550
Astragalus biflorus L. 241
Asystasia Bl. 538, 542
crispata Benth. 542
dalzelliana Sant. 542
gangetica (L.) Anders. 542, 543
violacea Clarke 542
Atalantia Corr. 379, 381, 382
wightii Tan. *75*, 382
Atragene zeylanica L. 63
Atropa physalodes L. 460
Atylosia W. & A. 234, 238
albicans (W. & A.) Benth. 238
lawii Wt. 238
lineata W. & A. 238
Averrhoa bilimbi L. 399
carambola L. 399
Axonopus Beauv. 706, 711
compressus (Sw.) Beauv. 712
Azadirachta Juss. 390, 393
indica Juss. 393
Azima Lam. 322
tetracantha Lam. *64*, 322

Bacopa Aubl. 515
monnieri (L.) Wettst. 517
procumbens (Miller) Greenm. 523
Baeobotrys dubia Wall. 203
indica Roxb. 203
Balanophora J. & G. Forst. 311
fungosa J. & G. Forst. *61*, 313
indica (Arn.) Griff. 313
BALANOPHORACEAE 22, 311
Ballota suaveolens L. 502
BALSAMINACEAE 18, 29, 399
Bambos arundinacea Retz. 712
stricta Roxb. 722
Bambusa Schreber 703, 712
arundinacea (Retz.) Roxb. 712

baccifera Roxb. 742
bambos Voss 712
scriptoria Dennst. 741
wightii Munro 755
Banalia thyrsiflora Moq. 108
Banisteria benghalensis L. 410
Banksea speciosa Koenig 770
Barleria L. 538, 543
auriculata Schum. 550
buxifolia L. 543
courtallica Nees *100*, 543
elata Dalz. 544
gibsonii auct. 544
involucrata Nees 543, 544
longifolia L. 549
montana Nees 544
montana auct. 544
prattensis Sant. 543, 544
Barnardia indica Wt. 800
Bartramia indica L. 138
Bassia latifolia Roxb. 194
longifolia Koenig 193
malabarica Bedd. 194
neriifolia Moon 194
Bauhinia L. 215, 217
benthamii Bedd. 217
phoenicea W. & A. 14, *49*, 217
purpurea L. 217
racemosa Lam. 217
variegata L. 217
Beaumontia Wall. 427, 430
jerdoniana Wt. *86*, 430
Beesha rheedii Kunth 741
Begonia L. 172
integrifolia Dalz. *35*, 172
malabarica Lam. *35*, 172, 174
BEGONIACEAE 22, 26, 172
Belamcanda Adanson 801
chinensis (L.) DC. 801
Belosynapsis Hassk. 641, 643
vivipara (Dalz.) Spr. & Fisch. 14, 644
Berghausea elata Miq. 733
Bergia L. 123
ammannioides Roxb. *25*, 123
verticillata Willd. 123
Beta vulgaris L. 101
Bidens L. 599, 602
bipinnata L. 602
biternata (Lour.) Sherff *104*, 602
pilosa L. 602
pilosa auct. 602
Bignonia atrovirens Roth 534
longifolia Willd. 536
stans L. 537
xylocarpa Roxb. 536
BIGNONIACEAE 25, 534
Biophytum DC. 397, 399
candolleanum Wt. 399
sensitivum (L.) DC. *77*, 399
Bischofia Bl. 329, 332
javanica Bl. *67*, 332
Bixa L. 169, 171
orellana L. *34*, 171
BIXACEAE 18, 27, 169
Blachia Baill. 330, 332
calycina Benth. 332
reflexa Benth. 332, 333
Blackwellia zeylanica Gard. 163
Blainvillea Cass. 599, 602
acmella (L.) Philip. *104*, 603
latifolia (L. f.) DC. 603
rhomboidea Cass. 603
Blepharis Juss. 538, 544
asperrima Nees *100*, 545
boerhaviifolia Pers. 545
maderaspatensis (L.) Roth 545
molluginifolia Pers. 545
repens (Vahl) Roth 545
Blumea DC. 597, 598, 603
amplectens DC. 606
barbata DC. 603, 604
belangeriana DC. 603, 604
flava DC. 619
hieraciifolia (Don) DC. 603, 604
lacera (Burm.) DC. *104*, 604
lanceolaria (Roxb.) Druce 603, 605
macrostachya DC. 604
membranacea DC. 604, 605
mollis (Don) Merr. 603, 605
neilgherriensis Hk. 605
obliqua (L.) Druce 603, 605
oxyodonta DC. 603, 606
pterodonta DC. 619
spectabilis DC. 605
virens DC. 604, 606
wightiana DC. 605
Blumeopsis flava (DC.) Gagnep. 619
Blyxa Pet. 633
aubertii L. 633
ceylanica Hk. 633
echinosperma (Cl.) Hk. 633
octandra (Roxb.) Thw. 633
talbotii Hk. 633
Boehmeria Jacq. 85

glomerulifera Miq. *16*, 87
malabarica Wedd. 87
platyphylla Don 87
Boerhavia L. 91
chinensis (L.) A. & S. 91
diffusa L. 91, 92
procumbens Roxb. 92
repanda Willd. 92
Boesenbergia Kuntze 762, 764
pulcherrima (Wall.) Kuntze *114*, 766
Bolboschoenus Palla 657, 658
maritimus (L.) Palla 658
BOMBACACEAE 27, 145
Bombax L. 145
ceiba auct. 145
heptaphyllum Cav. 145
insigne Wall. 146
malabaricum DC. 146
religiosum L. 171
BORAGINACEAE 25, 26, 477
Borago indica L. 483
zeylanica Burm. 483
Borreria Mey. 571, 573
articularis (L. f.) Will. 573
brachystema (Benth.) Valet. 574
hispida (L.) Schum. 573
ocymoides (Burm.) DC. 573, 574
pusilla (Wall.) DC. 573, 574
stricta (L. f.) Schum. 574
verticillata (L.) Mey. 573, 574
Boswellia Coleb. 370
glabra Roxb. 370
serrata Coleb. 12, *73*, 370
Bothriochloa Kuntze 705, 712
concanensis (Hk.) Henr. 713
Boucerosia campanulata Wt. 442
laciantha (Wt.) Br. 442
umbellata (Haw.) W. & A. 442
Bougainvillea spectabilis Willd. 92
Brachiaria Griseb. 706, 713
eruciformis (Sm.) Griseb. 713
miliiformis (Presl) Chase 713, 714
Brachypterum benthamii Thw. 247
Brachystelma R. Br. 439, 440
volubile Hk. *87*, 440
Bragantia wallichii W. & A. 56
Brassica L. 188
juncea (L.) Czer. 188, 189
BRASSICACEAE 28, 188
Bremekampia Sreem. 540, 546
neilgherryensis (Wt.) Sreem. 546
Breynia J. & G. Forst. 329, 333
patens (Roxb.) Rolfe 333
retusa (Dennst.) Alst. *67*, 333
Bridelia Willd. 330, 333
crenulata Roxb. *67*, 308, 334
retusa Spreng. 334
roxhurghiana (Muell.) Gehrm. 334
scandens (Roxb.) Willd. 334
zeylanica Gaertn. 342
Brugmansia suaveolens (Willd.) B. &. P. 459
Bryonia amplexicaulis Lam. 179
callosa Rottl. 176
laciniosa L. 177
laciniosa auct. 177
maysorensis W. & A. 181
palmata L. 177
scabrella L. f. 178
Bryonopsis laciniosa auct. 177
Bryophyllum pinnatum (Lam.) Oken 209
Buchanania Spreng. 372, 374
angustifolia Roxb. 374
axillaris (Desr.) Ramam. 374
lanzan Sprengel 12, *74*, 374
latifolia Roxb. 374
Buchnera L. 515, 517
angustifolia Don 526
asiatica L. 526
densiflora Benth. 527
euphrasioides auct. 526
gesnerioides Willd. 527
hispida Don 517
orobanchoides Engl. 527
Buddleja L. 509
asiatica Lour. *94*, 509
discolor Roth 509
BUDDLEJACEAE 18, 26, 509
Bulbophyllum Thouars 811, 814
acutiflorum Rich. 815
albidum (Wt.) Hk. 815
fimbriatum (Lindl.) Reich. f. 814
fischeri Seidenf. 814, 815
macraei auct. 815
gamblei (Hk.) Sm. 815
mysorense (Rolfe) Sm. 814, 815
neilgherrense Wt. 814, 815
proudlockii (K. & P.) Sm. 814, 815
thomsonii Hk. 815
tremulum Wt. 814, 816
wightii Reich. f. 815
Bulbostylis Kunth 657, 658
barbata (Rottb.) Cl. 659
capillaris (L.) Cl. 651

densa (Wall.) H.-M. 659
Burmannia L. 809
coelestis Don 809
pusilla (Miers) Thw. 809
BURMANNIACEAE 22, 809
BURSERACEAE 30, 369
Bursinopetalum arboreum Wt. 299
Butea Willd. 234, 238
frondosa Roxb. 238
monosperma (Lam.) Taub. 12, 238, Pl. 5.
Byttneria Loefl. 139
herbacea Roxb. 139

Cacalia sonchifolia L. 614
CACTACEAE 24, 26, 92
Cactus dillenii K.-G. 93
indicus Roxb. 94
monacanthus Willd. 94
Cadaba Forsk. 183
fruticosa (L.) Druce 12, *38*, 183
indica Lam. 183
Caesalpinia L. 215, 217
crista L. 218
cucullata Roxb. 222
decapetala (Roth) Alston 218
lacerans Roxb. 223
mimosoides Lam. 218
pulcherrima (L.) Sw. 218
sepiaria Roxb. 218
CAESALPINIOIDEAE 215
Cajan cajan (L.) Huth 239
Cajanus DC. 235, 239
cajan (L.) Millsp. 16 239
indicus Spreng. 239
Caladium viviparum (Roxb.) Lodd. 788
Calamus L. 774
huegelianus Mart. 775
nagbettai F. & D. 776
pseudotenuis Becc. & Hk. 14, 775
thwaitesii Becc. & Hk. 775
Caldesia Parl. 629, 631
parnassiifolia (L.) Parl. *105*, 631
reniformis (Don) Mak. 631
Callicarpa L. 484
arborea Roxb. 486
hookeri Cl. 486
lanata L. 486
tomentosa (L.) Murr. 14, *92*, 486
vestita Cl. 486
wallichiana Walp. 486
Callistephus wightianus (DC.) DC. 621
Calonyction bona-nox (L.) Boj. 469
muricatum (L.) Don 471
Calophanes vagans Wt. 547
Calophyllum L. 124
apetalum Willd. 14, 15, *26*, 124
decipens Wt. 124
wightianum P. &. T. 124
Calotropis R. Br. 437, 440
gigantea (L.) Dryand. 440
Calycopteris Lam. 292
floribunda (Roxb.) Poir. *55*, 292
Camellia sinensis (L.) Kuntze 121
Campanula gracilis Forst. 569
marginata Thunb. 569
CAMPANULACEAE 24, 566
Canarium L. 370, 371
strictum Roxb. *73*, 371
Canna L. 770
indica L. 770
orientalis Roscoe 770
CANNACEAE 22, 770
CANNABACEAE 18
Canscora Lam. 423
decurrens Dalz. 423
decussata Sch. & Sch. *85*, 423
diffusa (Vahl) R. Br. 423, 424
grandiflora Wt. 424
lawii Wt. 424
perfoliata Lam. *85*, 423, 424
Cansjera Juss. 301
rheedii Gmelin 302
Cantharospermum albicans W. & A. 238
Canthium Lam. 571, 574
angustifolium Roxb. 574
dicoccum (Gaert.) T. & B. 574, 575
didymum auct. 575
leschenaultii (DC.) W. & A. 575
parviflorum Lam. 11, 574, 575
thyrsoideum R. & S. 592
umbellatum Wt. 575
Capillipedium Stapf 704, 714
huegelii (Hack.) Stapf 714
CAPPARACEAE 27, 28, 183
Capparis L. 183, 185
cleghornii Gamble *38*, 185
divaricata Lam. 185
grandiflora Hk. & Th. 185, 186
horrida L. f. 186
pyrifolia auct. 186
sepiaria L. 185, 186
stylosa DC. 185
zeylanica L. *38*, 185, 186
Capraria crustacea L. 522

CAPRIFOLIACEAE 24, 593
Capsicum L. 456
annuum L. 456
fastigiatum Bl. 456
frutescens L. 456
Carallia Roxb. 297
brachiata (Lour.) Merr. 15, *57*, 297
integerrima DC. 297
Caralluma R. Br. 437, 441
adscendens (Roxb.) Hk. *87*, 441
attenuata Wt. 441
fimbriata Wall. 441
lasiantha (Wt.) Br. 442
stalagmifera Fischer 441
umbellata Haw. 11, 441, 442
Cardiospermum L. 365, 366
halicacabum L. *72*, 366
Carduus radicans Roxb. 625
Carex L. 657, 659
filicina Nees 660
glaucina Boeck. *110*, 659, 660
indica L. 659, 660
lindleyana Nees 660
maculata Boott 659, 660
mercarensis Steud. 660
ovata Burm. 674
raphidocarpa Nees 660
Careya Roxb. 157
arborea Roxb. 13, 157
Carissa L. 427, 430
carandas L. 431
congesta Wt. 431
inermis Vahl 431
paucinerva DC. *86*, 430, 431
Carmona Cav. 477
microphylla (Lam.) Don 477
retusa (Vahl) Masu. *91*, 477
Carpopogon monospermum Roxb. 259
CARYOPHYLLACEAE 28, 97
Caryota L. 774, 776
urens L. 14, 776
Casearia Jacq. 161
bourdillonii Mukh. 161
elliptica Willd. 162
esculenta Roxb. *32*, 161, 162
rubescens Dalz. 162
tomentosa Roxb. 162
varians auct. 161
Cassia L. 217, 218
auriculata L. 11, 219
corymbosa Ort. 219
fistula L. 219
florida Vahl 221
floribunda Cav. 219
glauca Lam. 221
hirsuta L. 219, 220
laevigata Willd. 219
mimosoides L. 218, 220
montana Roth 219, 220
occidentalis L. 219, 220
rhombifolia Roxb. 219
siamea Lam. 219, 221
sophera L. 220
surattensis Burm. 219, 221
tora L. 219, 221
Cassine L. 316
glauca (Rottb.) Kuntze 318
paniculata (W. & A.) Ramam. *63*, 318
Cassytha L. 43, 46
filiformis L. 46
Catha rothiana Walp. 320
Catharanthus Don 427, 431
pusillus (Murr.) Don *86*, 432
roseus (L.) Don 432
Catimbium malaccensis (Burm.) Holt. 762
Caulinia indica Willd. 638
Cayaponia laciniosa (L.) Jeff. 177
racemosa (Mill.) Cogn. 177
Cayratia Juss. 358
japonica (Thunb.) Gagn. *70*, 358
mollissima (Wall.) Gagn. 358, 359
pedata (Lour.) Gagn. 358, 359
Ceanothus paniculatus Roth 318
Cedrela Br. 395
toona Roxb. ex Rottl. 395
CELASTRACEAE 26, 29, 30, 316
Celastrus L. 316, 318
emarginatus Willd. 320
montanus Roth 320
paniculatus Willd. 318
rothianus Sch. 318
rothianus W. & A. 320
serrulatus Roth 320
verticillatus Roxb. 207
Celosia L. 102, 107
argentea L. *19*, 107
dichotoma Roth 105
nodiflora L. 105
Celtis L. 72
cinnamomea Lindl. 74
orientalis L. 75
serotina Planch. 72
tetrandra Roxb. 13, 72
wightii Planch. *14*, 72, 74

Cenchrus granularis L. 733
lappaceus L. 715
Centaurium Hill 423, 424
roxburghii (Don) Druce *85*, 424
Centella L. 414
asiatica (L.) Urb. 13, 416
Centipeda Lour. 597, 606
minima (L.) B. & A. 606
orbicularis Lour. 606
Centotheca Desv. 703, 714
lappaceus (L.) Desv. 715
latifolia (Osb.) Trin. 715
Centranthera R. Br. 515, 518
hispida R. Br. 518
indica (L.) Gamble *96*, 518
Centratherum Cass. 598, 607
anthelminticum (L.) Kuntze 607
phyllolaenum (DC.) Benth. & Hk. 607
Centunculus tenellus Duby 205
Cephalocroton indicum Bedd. 336
Cephalostigma schimperi Rich. 569
CERATOPHYLLACEAE 22, 60
Ceratophyllum L. 60
demersum L. *10*, 12, 60
Cereus bonplandii Pfeif. 93
Ceropegia L. 437, 442
bulbosa Roxb. 443
candelabrum L. 443
candelabrum auct. 445
elegans Wall. *87*, 443
fimbriifera Bedd. 443, 444
hirsuta W. & A. 443, 444, Frontispiece
juncea Roxb. *87*, 443, 444
mysorensis Wt. 443
spiralis Wt. 443, 445
tuberosa Roxb. 443
walkerae Wt. 443
Cestrum L. 456, 458
nocturnum L. 458
Chalcas paniculata L. 386
Chamaesyce cristata Webster 337
fimbriata R. & R. 338
hirta Millspaugh 338
thymifolia Millspaugh 339
Chamissoa nodiflora auct. 105
Chasalia Poir. 572, 575
curviflora auct. 576
ophioxyloides (Wall.) Craib *102*, 576
Cheilanthes mysurensis Hk. 12
CHENOPODIACEAE 23, 101
Chenopodium L. 101
album L. 101
ambrosioides L. 101
Chilocarpus Bl. 429, 433
atrovirens (Don) Bl. 433
atroviridis (DC.) Bl. 433
malabaricus Bedd. 433
Chionanthes ramiflora Roxb. 514
Chloris Sw. 706, 715
barbata Sw. 715
montana Roxb. 715
Chlorophytum K.-G. 792, 795
arundinaceum Baker *118*, 795
malabaricum Baker 796
laxum R. Br. 795
parviflorum Dalz. 795
tuberosum Baker 796
Chloroxylon DC. 381, 382, 395
dupada Ham. 370
swietenia DC. *75*, 383
Chomelia asiatica (L.) Kuntze 591
Chonemorpha Don 427, 432
antidysenterica (Roth) Don 434
fragrans (Moon) Alston *86*, 432
macrophylla (Roxb.) Don 432
Christella Leveille 857, 859
dentata (Forsk.) Brownsey & Jermy 860, 861
meeboldii (Rosenst.) Holttum 860
parasitica (L.) Lev. 860, 861
Christisonia Gard. 532
aurantiaca Wt. 532
bicolor Gard. 532, Pl. 7
tubulosa (Wt.) Hk. *98*, 532, 534, Pl. 8
Chromolaena DC. 597, 607
odorata (L.) K. & R. 608
Chrozophora Juss. 329, 334
rottleri (Geis.) Spr. 334
Chrysophyllum L. 191
roxburghii Don *40*, 193
Chrysopogon Trin. 704, 716
aciculatus (Retz.) Trin. 716
fulvus (Spreng.) Chiov. 716
hackelii (Hk.) Fischer *111*, 716
montanus Spreng. 716
orientalis (Desv.) Camus 716, 717
Cicendia fastigiata Griseb. 426
Cicer arietinum L. 16, 268
Cinnamomum Schaef. 43, 46
cathia Don 50
macrocarpum Hk. *7*, 46, 47
iners auct. 46, 47
perrotteii auct. 47
sulphuratum Nees 15, *7*, 46, 47

Cipadessa Bl. 390, 393
baccifera (Roth) Miq. 394
Cirrhopetalum fimbriatum Lindl. 814
gamblei Hk. 815
macraei auct. 815
mysorense Rolfe 815
proudlockii K. & P. 815
thomsonii Hk. 815
wightii Thw. 815
Cissampelos L. 64, 66
convolvulacea Willd. 66
hirsuta DC. 66
orbiculata DC. 66
pareira L. *12*, 66
Cissus L. 358, 359
adnata Roxb. 359
discolor Bl. 359, 360
pallida (W. & A.) Planch. *70*, 359, 360
pedata Lam. 359
quadrangularis L. 359, 360
Citharexylum fruticosum L. 494
spinosum L. 494
subserratum Sw. 494
Citrullus lanatus (Thunb.) Mansf. 181
vulgaris Schrad. 181
Citrus reticulata Blanco 389
Claoxylon muricatum Wt. 344
Clausena Burm. 381, 383
dentata (Willd.) Roemer *75*, 383
indica (Dalz.) Oliver 383
willdenowii W. & A. 383
Clematis L. 60
gouriana Roxb. *11*, 60
javana DC. 60
smilacifolia Wall. 60
Cleome L. 183, 186
fruticosa L. 183
monophylla L. 187
viscosa L. 187
Clerodendrum L. 484, 486
fragrans (Vent.) Willd. 487
inerme (L.) Gaertn. 486
infortunatum auct. 488
japonicum (Thunb.) Sweet 487
paniculatum L. 486, 487
philippinum Sch. 486, 487
serratum (L.) Moon 486, 487
viscosum Vent. 486, 488
Clinopodium martinicense Jacq. 504
Clitoria L. 234, 239
ternatea L. 239
CLUSIACEAE 18, 24, 27, 123
Cluytia scandens Roxb. 334
Cocculus DC. 64, 66
glaucescens Bl. 68
hirsutus (L.) Diels *12*, 67
Cochlospermum DC. 169, 171
gossypium DC. 171
religiosum (L.) Alston 12, 171
Cocos nucifera L. 16, 777
Coelachne R. Br. 704, 717
pulchella auct. 717
simpliciuscula (Steud.) Benth. 717
Coelachyrum Hoch. & Nees 705, 717
lagopoides (Burm.) Senar. 717
Coeloglossum secundum Lindl. 841
Coelogyne Lindl. 811, 816
breviscapa Lindl. 816
Coffea L. 593
arabica L. 16, 593
liberica Hiern 16
robusta Wildem. 16, 593
Coix L. 703, 718
lacryma-jobi L. *111*, 718
Coldenia L. 477, 479
procumbens L. 479
Colebrookea Sm. 496, 498
oppositifolia Sm. *93*, 499
ternifolia Roxb. 499
Coleus Lour. 496, 499
blumei Benth. 499
caninus (Roth) Vatke 11, 499
malabaricus Benth. 499
scutellarioides (L.) Benth. 499
spicatus Benth. 499
Colocasia Fabr. 782, 785
antiquorum Schott 786
esculenta (L.) Schott 786
Columella pedata Lour. 359
Columnea chinensis Osb. 519
heterophylla Roxb. 519
COMBRETACEAE 23, 27, 290
Combretum Loefl. 292
albidum Don 293
extensum Don 293
latifolium Bl. *55*, 293
ovalifolium Roxb. 293
Commelina L. 641, 644
axillaris L. 642
benghalensis L. 644
cristata L. 646
diffusa Burm. 644
elata Vahl 648
ensifolia R. Br. 644, 645

nudiflora L. 648
nudiflora auct. 644
obliqua Don 645
paludosa Bl. 644, 645
polyspatha Wt. 645
scaberrima Bl. 643
secundiflora Bl. 641
simplex Vahl 649
spirata L. 649
subulata Roth 644, 645
undulata R. Br. 645
COMMELINACEAE 21, 641
Commiphora Jacq. 370, 371
caudata (W. & A.) Engl. *73*, 371
CONNARACEAE 28, 30, 361
Connarus L. 363
ritchiei Hk. 363
santaloides Vahl 363
wightii Hk. *71*, 363
Conocarpus latifolia Roxb. 292
CONVOLVULACEAE 25, 463
Convolvulus aculeatus L. 469
alsinoides L. 468
bicolor Vahl 468
cairicus L. 470
cuneatus Willd. 466
gangeticus L. 473
hastatus Desr. 473
hispidus Vahl 470
hypocrateriformis Desr. 474
muricatus L. 471
nil L. 472
obscurus L. 472
repens L. 469
reptans L. 469
sublobatus L. f. 468
tridentatus L. 473
umbellatus L. 474
vitifolius Burm. 474
Conyanthes pusilla Miers 809
Conyza Less. 597, 608
anthelmintica L. 607
cinerea L. 627
floribunda H. B. K. 608
japonica (Thunb.) Less. 608
lacera Burm. 604
lanceolaria Roxb. 605
leucantha (Don) I . & R. 608, 609
stricta Willd. 608, 609
viscidula DC. 609
Corchorus L. 132
acutangulus Lam. 132
aestuans L. 132
trilocularis L. *28*, 132
urticifolius W. & A. 132, 134
Cordia L. 477, 479
evolutior (Cl.) Gamble 479
fulvosa Clarke 479
obliqua Willd. 480
obliqua auct. 480
retusa Vahl 477
tomentosa Wall. 480
wallichii Don *91*, 479, 480
Coreopsis biternata Lour. 602
Coriandrum sativum L. 418
CORNACEAE 27, 299
Cornutia corymbosa Lam. 491, 492
Coronopus Zinn. 188, 189
didymus (L.) Sm. 189
Cosmos Cav. 599, 609
sulphureus Cav. 609
Cosmostigma Wt. 439, 445
racemosum (Roxb.) Wt. 445
COSTACEAE 22, 769
Costus L. 769
speciosus (Koenig) Sm. 770
Cottonia Wt. 811, 816
championi Lindl. 824
macrostachya Wt. 816
peduncularis (Lindl.) Reichen. 816
Cotyledon laciniata L. 209
pinnata Lam. 209
Courtoisia Nees 657, 661
cyperoides (Roxb.) Nees 661
Cracca purpurea L. 266
Craspedum tectorium Lour. 131
Crassocephalum Moench 598, 609
crepidioides (Benth.) Moore 610
CRASSULACEAE 24, 207
Crateva L. 183, 187
marmelos L. 382
nurvala Ham. *38*, 187
religiosa auct. 187
Crepis acaulis (Roxb.) Hk. 620
Crinum L. 792 796
asiaticum L. 12, 796
defixum K.-G. 796
Crotalaria L. 234, 239
albida Roth 240, 241
angulata Miller 240, 241
berteroana DC. 240, 241
bifaria L. f. 240, 241
biflora (L.) L. 241
calycina Schrank 240, 241

fulva Roxb. 241
glabrescens Benth. 242
heyneana W. & A. *49*, 240, 242
hirta Willd. 240, 242
humifusa Benth. 240, 242
juncea L. 240, 242
macrophylla Willd. 254
mucronata Desv. 243
nana Burm. 244
obtecta W. & A. 240, 242
pallida Aiton *49*, 240, 243
paniculata Willd. 240, 243
pusilla Roth 240, 243
quinquefolia L. 240, 243
retusa L. 240, 243
salicifolia W. & A. 240, 244
semperflorens Vent. 244
striata DC. 243
triquetra Dalz. 240, 244
umbellata W. & A. 240, 244
walkeri Arn. 240, 244
Croton L. 329, 334
bonplandianus Baill. 335
malabaricus Bedd. 335
philippense Lam. 344
rottleri Geisler 334
sparsiflorus Morong 335
umbellatum auct. 332
Cryptocoryne Wydler 781, 786
meeboldii Engler 787
retrospiralis (Roxb.) Kunth 15, 786, Pl. 11
Cryptolepis R. Br. 439, 445
buchananii R. & S. 446
Cryptophragmium latifolium Dalz. 548
Cucumis L. 174, 176
callosus (Rottl.) Cogn. 176
maderaspatanus L. 178
melo L. 176
prophetarum L. *36*, 176
sativus L. 16, 176
trigonus Roxb. 176
Cucurbita maxima Lam. 16, 181
pepo DC. 181
CUCURBITACEAE 24, 174
Cunto Adanson 381
Curculigo Gaertn. 792, 796
malabarica Wt. 797
orchioides Gaertn. *118*, 797
Curcuma Roxb. 762, 766
neilgherrensis Wt. *113*, 766
pseudomontana Graham 766
Cyanotis Don 641, 645
arachnoidea Cl. 638
axillaris (L.) Don 642
cristata (L.) Don 646
cucullata (Roth) Kunth 642
fasciculata (Roth) Sch. 646
thwaitesii Hassk. 646
tuberosa (Roxb.) Sch. 646
vivipara Dalz. 644
Cyathea gigantea (Hk.) Holttum 15
Cyathocline Cass. 598, 610
lyrata Cass. 610
purpurea (Don) Kuntze 610
Cyathula Bl. 102, 107
prostrata (L.) Bl. 107
CYCADACEAE 20, 31
Cycas L. 31
circinalis L. 12, 31
Cyclea Wt. 64, 67
burmanii Hk. & Th. 67
peltata Hk. & Th. *12*, 67
Cyclosorus dentatus (Forsk.) Ching 860
gongylodes (Schk.) Link 859
interruptus Ching 859
interruptus (Willd.) Ching 859
jaculosus (Chr.) H. Ito 861
jaculosus sensu Panigrahi & Manton 861
laete-strigosus (Cl.) Ching 864
megaphyllus (Mett.) Ching 865
parasiticus (L.) Farwell 861
subpubescens sensu Holttum 860
Cyclostemon cuspidatus Bl. 74
macrophyllus auct. 335
Cylicodaphe floribunda Bl. 48
Cylista scariosa Roxb. 260
tomentosa Roxb. 262
villosa Aiton 262
Cymbidium Sw. 810, 811, 817
aloifolium (L.) Sw. 817
cyperifolium Wall. 817
ensifolium (L.) Sw. *123*, 817
haematodes Lindl. 817
ovatum Willd. 822
sinense Willd. 817
Cymbopogon Spreng. 705, 718
caesius (Hk. & A.) Stapf 718, 719
clandestinus (Steud.) Stapf 719
flexuosus (Steud.) Wats. 718, 719
nardus (L.) Rendle 718, 719
Cynanchum L. 437, 446
callialata Wt. 446
extensum Jacq. 451

indicum Burm. 454
pauciflorum R. Br. 446
reticulatum Retz. 450
tunicatum (Retz.) Alston 446
Cynodon Pers. 706, 719
arcuatus Presl 719
dactylon Pers. 720
intermedius R. & T. 719
ternatus Rich. 724
Cynoglossum L. 477, 480
denticulatum DC. 480
furcatum Wall. 480
lanceolatum Forsk. 480
meeboldii Brand. 480
zeylanicum (Hornem.) Thunb. *91*, 480
Cynometra L. 217, 221
bourdillonii Gamble *49*, 221
Cynosurus aegyptius L. 721
coracana L. 727
indicus L. 727
lagopoides Burm. 717
retroflexus Vahl 725
CYPERACEAE 21, 655
Cyperus L. 657, 661
albomarginatus (Nees) Steud. 692
alopecuroides Rottb. 662, 663
aristatus Rottb. 690
articulatus L. 662, 663
brevifolius (Rottb.) Hassk. 686, 687
castaneus Willd. 664
compressus L. 662, 663
cuspidatus Kunth 662, 664
cyperinus (Retz.) V.-S. 689
cyperoides (L.) Kuntze 691
diaphanus R. & S. 691
difformis L. 662, 664
diffusus Vahl 668
digitatus Roxb. 662, 664
distans L. f. *110*, 662, 663, 665
dubius Rottb. 690
eleusinoides Kunth 667
exaltatus Retz. 663, 665
flavidus auct. 670
globosus Alli. 692
haspan L. 662, 665
hyalinus Vahl 694
iria L. 662, 666
juncoides Lam. 666
kyllingia Endl. 687
laevigatus L. 662, 666
latespicatus Boeck. 691, 692
leucocephalus auct. 669
macrostachyos Lam. 692
macrostachyos L. 679
maderaspatanus Willd. 690
melanospermus (Nees) V.-S. 687
michelianus (L.) Link 662, 667
mitis Steud. 669
nilagiricus Steud. 692
nitens Retz. 693
nutans auct. 665
nutans Vahl 663, 665, 667
pangorei Rottb. 13, 662, 667
pilosus Vahl 662, 668
polystachyos Rottb. 693
pubisquama Steud. 662, 668
pulchellus R. Br. 662, 669
pumilus L. 693
pumilus Nees 694
pygmaeus Rottb. 667
rotundus L. *110*, 662, 669
rubicundus Vahl 662, 669
sanguinolentus Vahl 694
sesquiflorus M. & K. 687
squarrosus L. 662, 690
stramineus Nees 694
substramineus Kueken. 694
teneriffae Poir. 669
tenuiculmis Boeck. 662, 669
tenuispica Steud. 662, 670
uncinatus auct. 664
zollingeri auct. 669
Cyrilla aquatica Roxb. 520
Cyrtococcum Stapf 705, 720
accrescens (Trin.) Stapf 720
deccanense Bor 720
oxyphyllum (Steud.) Stapf 720
patens (L.) Camus 720, 721
patens auct. 720
Cyrtopera fusca Wt. 830
Cytisus cajan L. 238
pinnatus L. 248
sericeus Willd. 260

Dactylis spicata Willd. 727
Dactyloctenium Willd. 704, 706, 721
aegyptium (L.) Beauv. 721
Daemia extensa (Jacq.) R. Br. 451
Dalbergia L. f. 234, 245
acaciifolia Dalz. 245
frondosa Roxb. 245
lanceolaria L. f. 245
latifolia Roxb. 14, 245
latifolia auct. 246

multiflora Prain 246
paniculata Roxb. 16, 245, 246
sissoides W. & A. *49*, 245, 246
sympathetica Nimmo 245, 246
volubilis Roxb. 245, 246
Danthonia griffithiana Meull. 738
Datura L. 456, 458
alba Nees 458
fastuosa L. 458
metel L. *88*, 458, 459
stramonium L. 458, 459
Debregeasia Gaud. 85, 87
longifolia (Burm.) Wedd. 75, 87
velutina Gaud. 87
Decalepis W. & A. 439, 447
hamiltonii W. & A. 447
Decaneuron phyllolaenum DC. 607
Decaneurum dendigulense DC. 628
divergens (Roxb.) DC. 628
Delonix regia (Hk.) Raf. 225
Dendrobium Sw. 811, 819
aqueum Lindl. 819, Pl. 14
album Wt. 819
aureum Lindl. 820
bambusifolium P. & R. 820
barbatulum Lindl. 13, 819
barbatulum auct. 822
crepidatum Lindl. 819, 820, 821
dalzelli Dalz. 827
haemoglossum Thw. 819, 820
herbaceum Lindl. 819, 820
heterocarpum Lindl. 819, 820
heyneanum Lindl. 819, 820
jerdonianum Wt. 821
lawianum Lindl. 819, 821
mabelae Gammie 819, 821
macraei Lindl. 826
macrostachyum Lindl. 819, 821
microbulbon Rich. 821
microchilos Dalz. 828
nanum Hk. 819, 821
nutans Lindl. 13, 819, 821
ovatum (Willd.) Kranz. 819, 822
salaccense (Bl.) Lindl. 820
Dendrocalamus Nees 703, 721
strictus (Roxb.) Nees 722
Dendrochilum roseum Dalz. 821
Dendrophthoe Mart. 305
falcata (L. f.) Ett. 305, 307
gibbosa (Gamble) Razi 310
trigona (W. & A.) Sant. *60*, 305, 307
Dentella J. & G. Forst. 571, 576
erecta R. & S. 569
repens (L.) J. & G. Forst. 576
Derris Lour. 234, 247
benthamii (Thw.) Thw. 247
canarensis (Dalz.) Baker *49*, 247
eualata Bedd. 248
indica (Lam.) Benn. 247, 248, 310
pinnata Lour. 248
thyrsiflora (Benth.) Benth. 247, 248
Desmodium Desv. 234, 235, 248
caespitosum (Poir.) DC. 250
cephalotes Wall. 251
concinnum DC. 249
congestum W. & A. 251
dichotomum (Willd.) DC. 249
diffusum DC. 250
diffusum (Willd.) DC. 249
gyrans (L. f.) DC. 250
heterocarpon (L.) DC. 249
heterophyllum (Willd.) DC. 249, 250
laxiflorum DC. 249, 250
motorium (Houtt.) Merr. 249, 250
patens Wt. 249
polycarpum (Poiret) DC. 246
pulchellum (L.) Benth. 248, 251
recurvatum (Roxb.) W. & A. 250
triangulare (Retz.) Merr. 248, 251
triflorum (L.) DC. 249, 250, 251
triquetrum (L.) DC. 248, 252
Desmos Lour. 35
lawii (Hk. & Th.) Saff. *5*, 15, 37
Desmostemon zeylanicus Thw. 340
Desmotrichum fimbriatum auct. 826
Dialium coromandelicum Houtt. 376
Dianthera bicalyculata Retz. 556
Diatoma brachiata Lour. 297
Dichaespermum juncoides Wt. 649
Dicanthium Wille. 705, 722
annulatum (Forst.) Stapf 722
aristatum (Poir.) Hubb. 722
nodosum Wille. 722
DICHAPETALACEAE 30, 326
Dichapetalum Thour. 326
gelonioides (Roxb.) Engler *66*, 326
Dichrocephala DC. 597, 610
integrifolia (L. f.) Kuntze 611
latifolia (Lam.) DC. 611
Dicliptera Juss. 540, 546
cuneata Nees 546
Dicoma Cass 597, 611
lanuginosa DC. 611
tomentosa Cass. 611

Dictyospermum montanum Wt. 643
ovalifolium Wt. 643
protensum Wt. 643
Didymoplexis Griff. 810, 822
pallens Griff. 822
Digitaria Fabri. 706, 723
abludens (R. & S.) Veld. 723
adscendens (H. B. K.) Henr. 723
chinensis (Nees) Camus 724
ciliaris (Retz.) Koeler 723
denudata Link 724
fimbriata Link 723
granularis (Spr.) Henr. 723
longiflora (Retz.) Pers. 723, 724
marginata Link 724
pedicellaris (Hk.) Prain 723
stricta R. & S. 723, 724
ternata (Rich.) Dyer 723, 724
violascens Link 723, 724
Dillenia L. 114
pentagyna Roxb. 14, *21*, 114
DILLENIACEAE 27, 114
Dimeria R. Br. 706, 725
ornithopoda Trin. 725
pubescens Hackel 725
Dimocarpus Lour. 365, 366
longan Lour. *72*, 366
Dinebra Jacq. 705, 725
retroflexa (Vahl) Panz. 725
Dioscorea L. 806
belophylla Voigt 806
bulbifera L. 806, 808
daemona auct, 808
hispida Dennst. 06, 808
oppositifolia L. *121*, 806, 808
pentaphylla L. *121*, 806, 808
wallichii Hk. 806
DIOSCOREACEAE 21, 806
Diospyros L. 194
buxifolia (Bl.) Hiern 195
candolleana Wt. 195
canarica Bedd. 195
crumenata Thw. 195
dubia DC. 197
melanoxylon Roxb. *41*, 195, 197
microphylla Bedd. 195
montana Roxb. 12, 195, 197
nigrescens (Dalz.) Sald. *41*, 195, 197
pruriens Dalz. 15, *41*, 195, 197
sylvatica Roxb. 14, 195, 198
Diplacrum R. Br. 657, 670
caricinum R. Br. 670
Diplocentrum Lindl. 810, 822
congestum Wt. 822
Diplocelinium lindleyanum Wt. 174
Diploclisia Miers 64, 68
glaucescens (Bl.) Diels *12*, 68
Diplocyclos (Endl.) P. & K. 174, 177
palmatus (L.) Jeff. *36*, 174
Diploprora Hk. 811, 824
championi (Lindl.) Hk. *124*, 824
Dipteracanthus Nees 538, 546
prostratus (Poir.) Nees 547
DIPTEROCARPACEAE 28, 116
Dipterocarpus Gaertn. 116, 118
indicus Bedd. 14, *23*, 118
Dipterosperma personatum Hassk. 537
Disperis Sw. 810, 824
monophylla Fischer 824
neilgherrensis auct. 824
tripetaloides Lindl. 824
zeylanica Trimen *125*, 824
Dithyrocarpus petiolatus Wt. 647
rothii Wt. 647
undulatus 647
Dodonaea Miller 365, 367
viscosa Jacq. 11, 13, 367
Dolichandrone (Fen.) Seem. 534
atrovirens (Roth) Sprag. *99*, 534
Dolichos L. 235, 252
biflorus L. 268
falcatus Willd. 252
hirtus Andr. 262
lablab L. 268
pruriens L. 259
trilobata L. 267
trilobus L. 252
trilobus auct. 267
umbellatus Thunb. 267
Dondisia leschenaultii DC. 575
Dopatrium Benth. 515, 518
junceum (Roxb.) Benth. *96*, 518
Doritis wightii (Reich.) Benth. 842
Doronicum tenuifolium (Burm.) Wt. 621
wightii DC. 621
Dracaena L. 801, 803
spicata Roxb. 803
terminalis Wt. 803
terniflora Roxb. *119*, 803
Dregea Mey. 455
volubilis (L. f.) Hk. 455
Drosera L. 157
burmannii Vahl 13, *31*, 159
indica L. *31*, 159

peltata Sm. 15, *31*, 159
DROSERACEAE 28, 157
Drupatris cochinchinensis Lour. 198
Drymaria Willd. 97
cordata (L.) R. & S. *18*, 97
diandra Bl. 99
Dryopeia tripetaloides Thouars 824
Dryopteris cylindrothrix Rosenst. 861
didymosora C. Chr. 861
indica V. A. V. R. 864, 865
interrupta sensu Ching 859
interrupta (Willd.) Ching 859
meeboldii Rosenst. 860
ochthodes (Kunze) C. Chr. 865
ochthodes sensu V. A. V. R. 865
parasitica (L.) Kuntze 861
pteroides C. Chr. 859
uliginosa (Kunze) Chr. 863
Drypetes Vahl 329, 335
oblongifolia (Bedd.) A. S. 335
Dumasia DC. 235, 252
congesta W. & A. 252
villosa DC. 252
Duranta L. 484, 488
repens L. 488
Dyschoriste Nees 538, 547
depressa Nees 547
erecta (Burm.) Kuntze 547
vagans (Wt.) Kuntze 547
Dysodidendron glomeratum Gard. 591
Dysophylla Bl. 496, 500
auricularia (L.) Bl. 500
cruciata Benth. 500
tetraphylla Wt. 500
tomentosa Dalz. 500
stellata auct. 500
Dysoxylum Bl. 390, 394
binectariferum (Roxb.) Hk. & Bedd. 15, *76*, 394
macrocarpum Bedd. 394

EBENACEAE 24, 194
Ebermacera zeylanica Nees 548
Echinochloa Beauv. 706, 726
colonum (L.) Link *111*, 726
crusgalli (L.) Beauv. 726
stagnina (Retz.) Beauv. 726
Echinolaena polystachya H. B. K. 749
Echinops L. 598, 611
echinatus Roxb. 611
Echites antidysenterica Roth 434
cymosa Roxb. 429
fragrans Moon 432
laevigata Moon 436
macrophylla Roxb. 432
scholaris L. 429
Eclipta L. 599, 612
alba (L.) Hassk. 612
latifolia L. f. 603
prostrata (L.) L. 612
Ehretia L. 477, 480
canarensis (Cl.) Gamble 481
cuneata Wt. 482
laevis Roxb. 480
microphylla Lam. 477, 479
Eichhornia crassipes (Mart.) Solms 792
ELAEAGNACEAE 22, 295
Elaeagnus L. 295
conferta Roxb. 295
latifolia L. 295
ELAEOCARPACEAE 28, 129
Elaeocarpus L. 129
munronii (Wt.) Masters *27*, 129
oblongus Gaertn. 131
oblongus auct. 131
robustus Roxb. 131
serratus L. *27*, 129, 131
tectorius (Lour.) Poir. *27*, 129, 131
tuberculatus Roxb. 15, *27*, 129, 131
Elaeodendron glaucum (Rottb.) Pers. 318
paniculatum W. & A. 318
roxburghii W. & A. 318
Elate sylvestris L. 777
ELATINACEAE 29, 123
Elatostema J. & G. Forst. 85, 88
cuneatum Wt. 88
lineolatum Wt. 88
ovatum Wt. 89
surculosum Wt. 88
Eleocharis R. Br. 657, 671
acutangula (Roxb.) Schultes *110*, 671
afflata Steud. 672
atropurpurea (Retz.) Presl 671
capitata R. Br. 673
chaetaria R. & S. 673
congesta Don 671, 672
dulcis (Burm.) Hens. 671, 672
equisetina Presl 672
fistulosa Schultes 671
geniculata (L.) R. & S. 671, 672
plantaginea (Retz.) R. & S. 672
retroflexa (Poir.) Urb. 671, 673
Eleogenus atropurpureus Nees 672
Elephantopus L. 598, 612

scaber L. 612
Elettaria Maton 761, 767
cannicarpum Wt. 764
cardamomum (L.) Maton 13, 17, 767
Eleusine Gaertn. 705, 726
coracana (L.) Gaertn. 16, 727
indica (L.) Gaertn. 727
lagopoides (Burm.) Merr. 717
Elsholtzia paniculata (W. & A.) Engl. 507
Elytranthe capitellata (W. & A.) Engl. 308
loniceroides (L.) Don 308
Elytrophorus Beauv. 705, 727
spicatus (Willd.) Camus 727
Embelia Burm. 200, 202
glandulifera Wt. 202
ribes Burm. *43*, 202
tsjeriam-cottam DC. *43*, 202, 203
Emblica Gaertn. 329, 336
fischeri Gamble 336
officinalis Gaertn. 14, 336
Emermaiera zeylanica Nees 560
Emilia Cassini 598, 613
angustifolia DC. 613
alstonii Fosberg 613
exserta Fosberg 613
prenanthoidea DC. 613
scabra DC. 613
sonchifolia (L.) DC. 613, 614
Endostemon Br. 496, 501
viscosus (Roth) Ashby *93*, 501
Ensete Horan. 760
superbum (Roxb.) Cheesm. 761
Entada Adanson 225, 231
pursaetha DC. 14, *49*, 231
scandens auct. 231
Epaltes Cass. 597, 614
divaricata (L.) Cass. 614
Ephemerantha H. & S. 811, 826
macraei (Lindl.) H. & S. 826
Epidendrum aloifolium L. 817
ensifolium L. 817
retusum L. 846
tessellatum Roxb. 854
Epimeredi Adanson 497, 498
indicus (L.) Roth 498
malabaricus (L.) Rothm. 498
Epipogium R. Br. 810, 826
nutans Reich. 826
roseum (Don) Lindl. 826
Epiprinus Griff. 330, 336
mallotiformis (Meull.) Croiz. 336
Epithema Bl. 528, 530
carnosum Benth. 15, *97*, 530
ceylanicum auct. 530
Eragrostiella Bor 704, 727
bifaria (Vahl) Bor 728
Eragrostis Beauv. 704, 728
atrovirens (Desf.) Steud. 728, 729
bifaria (Vahl.) Steud. 728
deccanensis Bor 728, 729
diarrhena (Schult.) Steud. 728, 729
gangetica (Roxb.) Steud. 728, 729
maderaspatana Bor 728, 729
phleoides Hk. 729
riparia (Willd.) Nees 728, 730
spicata Jedw. 729
tenuifolia (Rich.) Steud. 728, 730
uniloides (Retz.) Steud. *111*, 728, 730
viscosa (Retz.) Trin. 728, 730
willdenowiana Hk. 729
Eranthemum L. 540, 548
capense L. 548
malabaricum Cl. 558
montanum Roxb. 548
Eremopogon (Hackel) Stapf 705, 730
foveolatus (Delile) Stapf 731
Eria Lindl. 811, 827
albiflora Rolfe 827
bracteata Dalz. & Gibs. 828
dalzellii (Dalz.) Lindl. 827
microchilos (Dalz.) Lindl. 827, 828
mysorensis Lindl. 827, 828
polystachya Rich. 828
pubescens Wt. 828
reticosa Wt. 827, 828
ERICACEAE 18, 24, 189
Erigeron L. 598, 614
alatum Don 619
asteroides Roxb. 614
hieraciifolium Don 604
japonicum Thunb. 608
leucanthus Don 609
molle Don 605
obliquum L. 606
Eriobotrya japonica (Thunb.) Lindl. 214
ERIOCAULACEAE 21, 650
Eriocaulon L. 650
brownianum Mart. 653
cinereum R. Br. 650, 652
dianae Fyson 650, 652
eleanorae Fyson 650, 652
heterolepis Steud. 650, 652
hookerianum Stapf 650, 653
infirmum Steud. 650, 653

longicuspis Hk. 653
nilagirense Steud. 650, 653
polycephalum Hk. 650, 653
quinquangulare L. *109*, 650, 654
robusto-brownianum Ruhl. *109*, 650, 654
setaceum L. 650, 654
sieboldianum Steud. 650
truncatum Ham. 15, 650, 654
Erinus procumbens Mill. 523
Eriocereus Berger 93
bonplandii (Pfeiff.) Ricco. 93
Eriochloa Kunth 706, 731
polystachya H. B. K. 731
procera (Retz.) Hubb. 731
Ervatamia Stapf 427, 433
heyneana (Wall.) Cooke *86*, 433
Erycibe Roxb. 464, 467
paniculata Roxb. *89*, 467
Erythraea roxburghii Don 424
Erythrina L. 234, 253
lithosperma Miq. 253
monosperma Lam. 238
mysorensis Gamble 253, 254
subumbrans (Hassk.) Merr. 253, 254
Erythropalum Bl. 299, 300
populifolium (Arn.) Mast. *58*, 300
ERYTHROXYLACEAE 30, 404
Erythroxylum L. 404
indicum (DC.) Bedd. 406
monogynum Roxb. 11, *79*, 406
Ethulia divaricata L. 614
Eucalyptus L' Herit. *52*, 283
Eugenia L. 278
bracteata (Willd.) DC. *52*, 278
caryophyllaea Wt. 280
codyensis Wt. 278
heyneana Duthie 281
jambolana Lam. 281
jambos L. 282
laeta Ham. 282
lanceolata Lam. 282
occidentalis Bourd. 282
pauciflora Wt. 282
spicata Lam. 283
Eulalia Kunth 705, 731
trispicata (Schultes) Henr. 732
tristachya Kuntze 732
Eulophia R. Br. 810, 828
emilianae Sald. *126*, 828, 830
nuda Lindl. 828, 830
Euodia J. & G. Forst. 381, 384
lunu-akenda (Gaertn.) Merr. 384
Euonymus L. 316, 319
goughii Wt. 319
indicus Wall. *63*, 313, 319
Eupatorium divergens Roxb. 627
odoratum L. 608
Euphorbia L. 327, 337
antiquorum L. 12, 337, 452
cristata Roth 337
fimbriata Roth 338
heyneana Spreng. 337, 339
hirta L. 337, 338
laciniata Ramam. 337, 338
laeta Roth 337, 338
microphylla Roth 339
nivulia Ham. 337, 338
notoptera Boiss. 337, 339
pulcherrima Klotz. 339
rothiana Spreng. 338
thymifolia L. 337, 339
tirucalli L. 337, 339
EUPHORBIACEAE 22, 23, 27, 29, 30, 327
Euphoria longan (Lour.) Steud. 366
Euphoria longana Lam. 366
Eurya Thunb. 121
japonica Thunb. *24*, 121
Eusteralis Raein. 500
Evolvulus L. 461, 467
alsinoides (L.) *89*, 468
emarginatus Burm. 473
Exacum L. 423, 424
bicolor Roxb. 15, 425
carinatum Roxb. 425
lawii Clarke 426
pedunculatum L. 425
petiolare Griseb. 425
pumilum Griseb. 425
sessile L. 425, 426
Exallage auricularia (L.) Bremek. 585
Excoecaria L. 329, 339
crenulata Wt. 340
robusta Hk. 340

FABACEAE 23, 24, 28, 215
FABOIDEAE 215, 233
Fagara L. 388
budrunga Roxb. 389
lunu-akenda Gaertn. 384
rhetsa Roxb. 389
Fagraea Thunb. 418
ceilanica Thunb. 13, *84*, 418
coromandelina Wt. 418
malabarica Wt. 418

obovata Wall. 418
Fahrenheitia R. & Z. 329, 340
zeylanica (Thw.) A. S. *67*, 340
Ficus L. 77, 78
amplissima Sm. 79
angustifolia Roxb. 82
arnottiana (Miq.) Miq. 79
asperrima Roxb. 81
benghalensis L. 12, 79, 80
callosa Willd. 79, 80
daemona Vahl 81
drupacea Thunb. 12, 79, 80
exasperata Vahl 79, 81
gibbosa Bl. 83
glomerata Roxb. 82
hispida L. f. *15*, 78, 81
infectoria Roxb. 83
microcarpa L. f. 79, 81
mysorensis Roth 80
nervosa Roth 79, 82
oppositifolia Roxb. 81
parasitica Willd. 83
racemosa L. *15*, 78, 82
religiosa L. 79, 82
retusa auct. 81
talbotii King 79, 82
tinctoria Forst. 78, 83
tsiela Ham. 79
tsjahela Burm. 79, 83
tuberculata Roxb. 83
virens Aiton 79, 83
Fimbristylis Vahl 657, 673
acuminata Vahl 674, 675
aestivalis (Retz.) Vahl 674, 675
alboviridis Clarke 674, 675
annua R. & S. 677
aphylla Steud. 674, 675
argentea (Rottb.) Vahl 674, 676
autumnalis (L.) R. & S. 677
bisumbellata (Forsk.) Bub. 674, 676
cinnamometorum (Vahl) Kunth 674, 676
compalanata (Retz.) Link 674, 677
cyperoides R. Br. 677
dichotoma (L.) Vahl 674, 677
dichotoma auct. 676
diphylla (Retz.) Vahl 677
dipsacea (Rottb.) Cl. 674, 678
eragrostis (Nees) Hance 674, 678
falcata (Vahl) Kunth 674, 678
ferruginea (L.) Vahl 674, 679
iunciformis (Nees) Kunth 678
littoralis Gaud. 679
miliacea (L.) Vahl 674, 679
monostachyos (L.) Hassk. 679
nigrobrunnea Thw. 678
ovata (Burm.) Kern 674, 679
oxylepis Steud. 681
podocarpa Nees 674, 680
quinquangularis (Vahl) Kunth 675
salbundia (Nees) Kunth 676
scabrida Schumach. 681
schoenoides (Retz.) Vahl 674, 680
sieberiana Kunth 674, 679, 680
squarrosa Vahl 674, 681
tenera Schultes 674, 681
tetragona R. Br. 674, 681
velata R. Br. 681
woodrowii Clarke 674, 682
Firmiana Mars. 139
colorata (Roxb.) R. Br. 141
Flacourtia L'Herit. 161, 162
indica (Burm.) Merr. ***32***, 162
montana Graham 162, 163
ramontchi L'Herit. 162
sepiaria Roxb. 163
FLACOURTIACEAE 18, 23, 24, 26, 28, 159
Flaveria Juss. 599, 615
australasica Hk. 615
Flemingia Roxb. 234, 254
congesta Aiton 254
macrophylla (Willd.) Merr. 254
nilgheriensis (Baker) Cooke 254
procumbens Wt. 254
strobilifera (L.) Aiton 254, 255
vestita Hk. 254
Fleurya interrupta (L.) Gaud. 89
FLINDERSIACEAE 382, 395
Floscopa Lour. 641, 647
scandens Lour. 647
Fluggea leucopyrus Willd. 348
virosa (Willd.) Baill. 348
Fuirena Rottb. 657, 682
ciliaris (L.) Roxb. 683
glomerata auct. 683
leptostachya Oliv. 683
pubescens (Lam.) Kunth 684
trilobites Clarke 683
umbellata Rottb. 683
uncinata (Willd.) Kunth 683, 684
wallichiana Kunth 683, 684
Furcraea Vent. 801, 803
foetida (L.) Haworth *119*, 803
gigantea Vent. 803

Galactia P. Br. 235, 255
tenuiflora (Willd.) W. & A. 255
Galedupa indica Lam. 248
Galinsoga R. & P. 599, 615
parviflora Cav. *104*, 615
Garcinia L. 124
cambogia (Gaertn.) Desr. *26*, 126
conicarpa Wt. 126
malabarica Talb. 127
morella (Gaertn.) Desr. 126
ovalifolia Hk. 126
pictoria Roxb. 126
talbotii Raiz. & Sant. *26*, 126
tinctoria Dunn 127
xanthochymus Ander. 126, 127
Gardenia Ellis 571, 576
dumetorum Retz. 592
latifolia Aiton *102*, 576
lucida Roxb. 577
resinifera Roth 576, 577
spinosa Thunb. 592, 593
turgida Roxb. 576, 577
uliginosa Retz. 593
Gardneria Wall. 418, 420
ovata Wall. *84*, 420
Garnotia Brong. 704, 732
arborum Cooke *111*, 732
arundinacea Hk. 732, 733
elata (Miq.) Janow. 732, 733
scoparia auct. 733
stricta Brong. 732, 733
Garuga Roxb. 370, 372
pinnata Roxb. *73*, 372
Gastrochilus Don 811, 830
calceolaris (Sm.) Don 831
dalzellianus (Sant.) S. K. 851
dasypogon (Rees) Kuntze 830
dasypogon auct. 831
flabelliformis (B. & M.) Sald. 830, Pl. 15
maculatus (Dalz.) Kuntze 850
pulchellus (Wt.) Schlecter 830, Pl. 16
pulcherrima (Wall.) 766
Geissaspis Wt. & A. 234, 255
tenella Benth. 256
Gendarussa wynaadensis Nees 552
Genianthus Hk. 439, 447
laurifolius (Roxb.) Hk. 447
Gentiana diffusa Vahl 424
GENTIANACEAE 18, 25, 26, 421
Geodorum Jack. 810, 831
densiflorum (Lam.) Schl. 831
GERANIACEAE 18
Gerardia delphiniifolia L. 525
GESNERIACEAE 25, 528
Getonia floribunda Roxb. 292
Girardinia Gaud. 85, 88
zeylanica Decaisne *16*, 89
Gironniera Gaud. 72, 74
cuspidata (Bl.) Kurz 74
reticulata Thw. 74
Givotia Griff. 329, 340
rottleriformis Griff. *67*, 341
Glinus L. 95
lotoides L. 95
oppositifolius (L.) DC. *17*, 95
Gliricidia sepium (Jacq.) Kunth 268
Globba L. 762, 767
bulbifera Roxb. *113*, 767
canarensis Baker 767
ophioglossa Wt. 767
Glochidion J. & G. Forst. 330, 341
ellipticum Wt. 341
johnstonei Hk. 341
tomentosum Dalz. 341, 342
zeylanicum (Gaertn.) Juss. 341, 342
Gloriosa L. 792, 797
superba L. 797
Glossocardia Cass. 598, 615
bosvallea (L. f.) DC. 616
Glossostigma W. & A. 515, 518
diandrum (L.) Kuntze *96*, 518
spathulatum (Hk.) Arn. 519
Glycine Willd. 235, 256
javanica auct. 256
max (L.) Merr. 16
mollis W. & A. 266
rufescens Willd. 262
tenuiflora Willd. 255
wightii (W. & A.) Verd. 256
Glycosmis Corr. 381, 384, 385
arborea (Roxb.) DC. 384, 385
citrifolia (Willd.) Lindl. 385
cochinchinensis (Lour.) Eng. 385
cochinchinensis auct. 385
mauritiana (Lam.) Tanaka 384, 385
parviflora (Sims) Little 385
pentaphylla (Roxb.) DC. 385
pentaphylla (Retz.) Corr. 385
pentaphylla auct. 385
triphylla Wt. 385
Glycycarpus racemosus Dalz. 377
Gmelina L. 484, 489
arborea Roxb. 13, *92*, 489
indica Burm. 162

Gnaphalium L. 597, 616
indicum auct. 616
luteo-album L. 616
polycaulon Pers. 616
GNETACEAE 20, 32
Gnetum L. 32
funiculare Wt. 32
ula Brong. 14, 32, Pl. 1
Gnidia L. 275
glauca (Fres.) Gilg *51*, 275, 277
eriocephala Graham 275
Gomphandra Lindl. 324
polymorpha Wt. 325
tetrandra (Wall.) Sleumer *65*, 324
Gomphostemma Benth. 496, 501
heyneanum Benth. 501
Gomphrena L. 102, 108
celosioides Mart. *19*, 108
decumbens auct. 108
sessilis L. 106
Goniopteris prolifera (Retz.) Presl 858
Goniothalamus Hk. & Th. 34, 35, 37
cardiopetalus (Dalz.) Hk. & Th. *5*, 37
Gonyanthes pusilla Miers 809
Gordonia Ellis 121
obtusa W. & A. 15, *24*, 121, Pl. 2
Gossypium L. 156
Gouania L. 350, 351
microcarpa DC. *68*, 351
Granadilla hondala Gaertn. 168
Grangea Adanson 597, 616
latifolia Lam. 611
maderaspatana (L.) Poir. 617
Gratiola L. 517
ciliata Colsm. 521
cordifolia Colsm. 521
hyssopoides L. 522
juncea Roxb. 518
monnieri (L.) L. 517
parviflora Roxb. 522
pusilla Willd. 523
serrata Roxb. 521
veronicifolia Retz. 521
Grevillea robusta R. Br. 297
Grewia L. 132, 133
bracteata auct. 136
columnaris Sm. 136
disperma Spreng. 134, 135
flavescens Juss. 134, 135
hirsuta Vahl 134, 135
lawsoniana Gamble 134, 135
microcos L. 134, 136
obtusa Gamble 134, 136
orbiculata Rottler 134, 136
orientalis L. 134, 136
rotundifolia Juss. 136
tiliifolia Vahl *28*, 134, 137
ulmifolia Roxb. 136
umbellifera Bedd. *28*, 134, 137
Griffithia rugulosa Thw. 590
speciosa Bedd. 590
Grumilea nigra Gaertn. 589
Guarea binectarifera Roxb. 394
Guatteria fragrans Falz. 39
Guizotia Cass. 599, 617
abyssinica (L. f.) Cass. 617
GUTTIFERAE 18
Gymnema R. Br. 439, 448
sylvestre (Retz.) Schultes 12, 448
Gymnosporia emarginata (Willd.) Roth 320
montana (Roth) Benth 320
rothiana (Walp.) Lawson 320
Gymnostachyum Nees 540, 548
febrifugum Benth. 549
latifolium (Dalz.) Ander. 548, 549
Gymnothrix cenchroides R. & S. 747
Gynura Cass. 597, 617
ecalyculata DC. 613
crepidioides Benth. 610
lycopersicifolia DC. 618
nitida DC. 618

Habenaria Willd. 810, 831
aristata (Lindl.) Hk. 841
crinifera Lindl. 832
elwesii Hk. 832
goodyeroides Don 841
grandifloriformis B. & M. 832
grandiflora Lindl. 832
heyneana Lindl. 832, 833
longecalcarata Rich. 833
longicorniculata Graham 832, 833
marginata Coleb. 12, 832, 833
modesta Dalz. 834
multicaudata Sedgew. 832, 833
ovalifolia Wt. 832, 833
plantaginea Lindl. 832, 834
platyphylla Spreng. 834
robustior (Wt.) Hk. 841
roxburghii Nicols. 12, 832, 834
susannae (L.) Sprengel 844
torta Hk. 842
viridiflora (Sw.) R. Br. 832, 834
Hackelochloa Kuntze 704, 733

granularis (L.) Kuntze 733
HAEMODORACEAE 18
HALORAGACEAE 26, 270
Haloragis oligantha W. & A. 270
Hapalosa loeflingiae W. & A. 99
Haplanthus neilgherryensis Wt. 546
Hardwickia pinnata DC. 222
Harpullia Roxb. 365, 367
arborea (Blan.) Radlk. 367
imbricata Thw. 367
Heckeria Kunth 50
subpeltata (Willd.) Kunth 52
Hedychium Koenig 762, 767
coronarium Koenig 768
Hedyotis affinis R. & S. 585
aspera Roth 585
auricularia L. 585
caerulea W. & A. 586
dichotoma Roth 585
foetida Dalz. 583
glabella Bedd. 586
herbacea L. 586
heynei auct. 585
nitida W. & A. 586
quadrilocularis Thw. 583
Hedysarum bupleurifolium L. 237
caespitosum Poir. 250
dichotomum Willd. 249
diffusum Willd. 249
diffusum Roxb. 250
gyrans L. f. 250
heterocarpon L. 249
heterophyllum Willd. 250
linifolium L. f. 257
lutescens Poir. 262
moniliferum L. 237
motorium Houtt. 250
polycarpum Poir. 249
prostratum L. 257
pulchellum L. 251
recurvatum Roxb. 250
rugosum Willd. 237
strobiliferum L. 255
triangulare Retz. 251
triflorum L. 251
triquetrum L. 252
violaceum Forsk. 237
viscidum L. 261
Helicia Lour. 295
nilagirica Bedd. 15, *56*, 295
Helicteres L. 139, 141
isora L. 141
Heliotropium L. 477, 481
bracteatum R. Br. *91*, 481
coromandelianum Retz. 482
indicum L. 481
marifolium Retz. 481
ovalifolium Forsk. *91*, 481, 482
scabrum Retz. 482
Helixanthera Lour. 305, 307
intermedia (Hk.) Danser 307
wallichiana (Schultes) Danser *60*, 307
Helosciadium heyneanum DC. 417
wallichianum Miq. 417
Hemicarpha Nees 657, 658, 685
isolepis Nees 685
Hemichoriste montana Nees 551
Hemidesmus R. Br. 439, 448
indicus (L.) R. Br. *87*, 448
Hemigraphis Nees 540, 549
latebrosa (Roth) Nees 549
Hemigryrosa deficiens (W. & A.) Bedd. 368
Hemionitis prolifera Retz. 858
Heracleum L. 414, 416
rigens DC. *83*, 416
Heritiera Aiton 139, 141
papilio Bedd. 142
Hesperethusa Roemer 387
crenulata (Roxb.) Roemer 387
Heteropogon Pers. 704, 734
contortus (L.) Beauv. 734
Hewittia W. & A. 464, 468
bicolor (Vahl) W. & A. 468
sublobata (L. f.) Kuntze 468
Heynea affinis Juss. 396
trifolia Juss. 396
trijuga Sims 396
Hibiscus L. 148, 150
abelmoschus L. 149
cannabinus L. 150, 151
ficulneus L. 148
furcatus Willd. 150, 151
lampas Cav. 156
lobatus (Murr.) Kuntze 150, 151
manihot L. 148
micranthus L. f. 151
ovalifolius (Forsk.) Vahl 151
panduriformis Burm. 151, 152
populneus L. 156
solandra L'Herit. 151
tetraphyllus Hornem. 148
trionum L. *30*, 151, 152
zeylanicus L. 154
Hippia integrifolia L. f. 611

Hippocratea arnottiana Wt. 315
bourdillonii Gamble 315
indica Willd. 315
HIPPOCRATEACEAE 29, 313
Hiptage Gaertn. 408
benghalensis (L.) Kurz *80*, 410
madablota Gaertn. 410
Hiraea cordata Wall. 408
Holarrhena R. Br. 427, 434
antidysenterica (Roth) DC. 434
Holcus ciliatus Roxb. 710
latifolius Osb. 715
Holigarna Roxb. 372, 375
albicans Hk. 375
ferruginea March. 375
grahamii (Wt.) Kurz *74*, 375
wightii Balak. 375
Holoptelea Planch. 72, 74
integrifolia (Roxb.) Planch. *14*, 75
Holostemma R. Br. 439, 449
annulare (Roxb.) Schum. 449
rheedei Wall. 449
Holosteum cordatum L. 99
Homalium Jacq. 161, 163
tetrandra Wt. 163
zeylanicum (Gard.) Benth. *32*, 163
Homonoia Lour. 330, 342
riparia Lour. 15, *67*, 342
Hopea Roxb. 116, 118
wightiana W. & A. *23*, 118, 310
Hoppea Willd. 423, 426
dichotoma Willd. *85*, 426
fastigiata (Griseb.) C. B. Cl. 426
Hottonia indica L. 520
Hoya R. Br. 439, 449
ovalifolia W. & A. 449
pauciflora Wt. 449
pendula auct. 450
retusa Dalz. 449, 450
viridiflora R. Br. 455
wightii Hk. 87, 449, 450
Humboldtia Vahl 215, 222
brunonis Wall. *49*, 222
Hunteria atrovirens Don 433
atroviridis DC. 433
Hybanthus Jacq. 165
enneaspermus (L.) Muell. *33*, 165, 167
suffruticosus (L.) Baill. 165, 167
Hydnocarpus Gaertn. 161, 164
laurifolia (Dennst.) Sleumer 164
wightiana Bl. 164
Hydrilla Rich. 632, 633
verticillata (L. f.) Royle 12, 634
Hydrobryopsis Engler 269
sessilis (Willis) Engler 269
Hydrobryum sessile Willis 269
HYDROCHARITACEAE 21, 632
Hydrocotyle L. 414, 416
asiatica L. 416
javanica Thunb. 416
polycephala W. & A. 417
rotundifolia DC. 417
sibthorpioides Lam. 416, 417
Hydrotrophus echinospermus Cl. 633
Hygrophila R. Br. 538, 540, 549
angustifolia auct. 550
auriculata (Schum.) Heine 549
longifolia Nees 549
salicifolia (Vahl) Nees 549, 550
Hymenodictyon Wall. 571, 577
obovatum Wall. 577
Hypaelyptum argenteum Vahl 688
sphacelatum Vahl 689
Hypaphorus subumbrans Hassk. 253
HYPERICACEAE 18
Hypericum L. 123, 127
japonicum Murr. *26*, 127
mysurense W. & A. 128
Hypolytrum Rich. 657, 685
latifolium Rich. 685
nemorum (Vahl) Sprengel 685
purpurascens Cherm 686
Hypoporum pergracile Nees 701
Hypoxis L. 792, 797
aurea L. *118*, 797
Hyptis Jacq. 496, 501
suaveolens (L.) Poit. 502

ICACINACEAE 25, 28, 322
Ichnocarpus R. Br. 429, 435
frutescens (L.) R. Br. 12, 435
Illecebrum monsoniae L. f. 104
Ilysanthes hyssopoides (L.) Benth. 522
parviflora (Roxb.) Benth. 522
serrata (Roxb.) Urban 521
veronicifolia (Retz.) Urban 521
Impatiens L. 399
balsamina L. *78*, 400
barberi Hk. 14, *78*, 400
chinensis L. 400, 402
diversifolia W. & A. *78*, 400, 402
fasciculata Lam. 402
filiformis W. & A. 403
gardneriana Wt. *78*, 400, 402

herbicola Hk. *78*, 400, 402
inconspicua W. & A. *78*, 400, 403
kleinii W. & A. 400, 403
oppositifolia L. 400, 403
pusilla Hk. & Th. 403
rivalis Wt. 403
rosmarinifolia Retz. 403
rosmarinifolia auct. 403
scapiflora Roxb. 15, 400, 403
stocksii Hk. & Th. 14, *78*, 400, 404
trichocarpa Hk. 400, 404
Imperata Cyrillo 703, 734
cylindrica (L.) Beauv. 734
koenigii (Retz.) Beauv. 734
Indigofera L. 234, 256
cassioides DC. 257
endecaphylla Jacq. 258
endecaphylla Lam. 258
enneaphylla L. 257
linifolia (L. f.) Retz. 256, 257
linnaei Ali 257
prostrata Willd. 256, 257
prostrata (L.) Domin 257
pulchella Roxb. 257
spicata Forsk. 257, 258
tinctoria L. 257, 258
trifoliata L. 256, 258
trita L. f. 256, 258
wightii W. & A. 257, 258
Indobanalia Henry & Roy 102, 108
thyrsiflora (Moquin) H. & R. *19*, 108
Indopoa Bor 704, 735
paupercula (Stapf) Bor 735
Inga dulcis (Roxb.) Willd. 232
Inula indica L. 628
Ionidium enneaspermum (L.) Vent. 167
suffruticosum (L.) DC. 165
Iphigenia Kunth 793, 798
indica (L.) Gray. 798
mysorensis A. & R. 798
pallida Baker 798
Ipomoea L. 464, 468
alba L. 469
angulata Lam. 471
aquatica Forsk. 13, 469
barlerioides (Choisy) Cl. 469, 470
batatas (L.) Lam. 16
bona-nox L. 469
cairica (L.) Sw. *89*, 469, 470
campanulata auct. 471
elliptica Roth 466
eriocarpa R. Br. 464, 469, 470
hederifolia L. 469, 471
hederacea auct. 472
hispida (Vahl) R. & S. 470
illustris (Cl.) Prain 469, 471
imbricata Roth 466
muricata (L.) Jacq. 464, 469, 471
nil (L.) Roth 469, 472
obscura (L.) K.-G. 464, 469, 472
phoenicea Roxb. 471
pulchella Wt. 470
repens auct. 469
reptans Poir. 469
sessiliflora Roth 470
staphylina R. & S. 469, 472
IRIDACEAE 22, 801
Isachne R. Br. 705, 735
dispar Trin. 735, 736
elegans Hk. 735, 736
globosa (Thunb.) Kuntze 735, 736
miliacea Roth 735, 736
setosa Fischer 15, 735, 736
Isanthera permollis Nees 531
Ischaemum L. 705, 736
aristatum auct. 737
barbatum Retz. 737
goebelii Hackel 737
indicum (Houtt.) Merr. 737
thomsonianum Fischer 737
Isolepis corymbosus R. & S. 697
inclinatus Delile 697
senegalensis Hochst. ex Steud. 699
squarrosa (L.) Kunth 696
trifida Nees 659
uninodis Delile 698
Isonandra Wt. 191, 193
stocksii Cl. *40*, 193
Ixia chinensis L. 801
Ixora L. 572, 578
arborea J. E. Sm. 578
elongata Don 578
leucantha Don 578
nigricans W. & A. 578, 579
parviflora Vahl 578
polyantha Wt. 578, 579

Jacaranda acutifolia H. & B. 537
Jambolifera L. 381
pedunculata L. 381
Jambosa hemispherica Walp. 281
laeta (Ham.) Bl. 282
occidentalis (Bourd.) Gamble 282
pauciflora Wt. 282

vulgaris DC. 282
Jansenella Bor 704, 738
griffithiana (Muell.) Bor 15, 738
Jasminum L. 512
azoricum L. *95*, 512
cuspidatum Rottler 512
flexile Vahl. 512
malabaricum Wt. *95*, 512, 513
rigidum Zenker 512
ritchiei Cl. *95*, 512, 513
rottlerianum DC. 512, 513
roxburghianum Cl. 12, 512, 513
Jatropha L. 329, 342
curcas L. 343
Jerdonia Wt. 528, 530
indica Wt. *97*, 530
Johnia wightii (W. & A.) W. & A. 256
Jonesia asoca Roxb. 224
Josephia lanceolata Wt. 849
latifolia Wt. 849
JUNCACEAE 21, 655
Juncellus Clarke 661
alopecuroides (Rottb.) Cl. 663
laevigatus (L.) Cl. 666
pygmaeus (Rottb.) Cl. 667
Juncus L. 655
prismatocarpus R. Br. 655
Jussiaea adscendens L. 285
octonervia Lam. 285
repens L. 285
suffruticosa L. 285
Justicia L. 538, 540, 550
adhatoda L. 540
alata Vahl 541
andersonii Ramam. *100*, 550, 551
betonica L. 550, 551
crinita Thunb. 551
gangetica L. 543
glabra Roxb. 550, 551
micrantha Clarke 551
montana (Nees) Anders. 551
nasuta L. 558
neesii Ramam. 550, 551
nilgherrensis (Nees) Anders. 550, 552
pectinata L. 559
procumbens L. 552
repens L. 559
serpyllifolia Vahl 542
simplex Don 550, 552
wynaadensis (Nees) Anders. 550, 552

Kalanchoe Adanson 207
bhidei Cooke *46*, 209
floribunda W. & A. *46*, 209
laciniata (L.) Pers. *46*, 209
pinnata (Lam.) Pers. 209
Keura odorifera Forsk. 780
Kigelia pinnata (Jacq.) DC. 537
Kingidium decumbens (Griff.) Hunt 842
Kingiella decumbens (Griff.) Rolfe 842
Kingiodendron Harms 215, 222
pinnatum (DC.) Harms 14, 222
Kirganelia A. Juss. 329, 343
reticulata (Poir.) Baill. 343
Klugia notoniana (Wall.) DC. 531
Knema L. 40
attenuata (Hk. & Th.) Warb. *6*, 42
Knoxia L. 571, 579
corymbosa auct. 579
sumatrensis (Retz.) DC. 579
Kohautia aspera (Roth) Bremek. 585
Kydia Roxb. 146, 152
calycina Roxb. *30*, 152
roxburghiana Wt. 153
Kyllinga Rottb. 657, 661, 686
brevifolia Rottb. 686
cylindrica Nees 687
cyperina Retz. 689
cyperoides Roxb. 661
melanosperma Nees 686, 687
monocephala Rottb. 687
nemoralis (Forst.) Dandy 686, 687
odorata Vahl 686, 687
panicea Rottb. 690
tenuifolia Steud. 686, 688
triceps Lam. 689
triceps Rottb. 688

Lablab purpureus (L.) Sw. 268
Lactuca glabra DC. 620
Lagarosiphon alternifolia Druce 634
Lagascea Cav. 597, 618
mollis Cav. 618
Lagenandra Dalz. 781, 786
meeboldii (Eng.) Fischer 787
ovata (L.) Thw. 15, 787, Pl. 12
toxicaria Dalz. 787
Lagenaria vulgaris Ser. 181
siceraria (Mol.) Standl. 181
Lagerstroemia L. 272
flos-reginae Retz. 273
lanceolata Clarke 273
microcarpa Wt. 14, 273
parviflora Roxb. 273

reginae Roxb. 273
thomsonii Koehne 273
Laggera Oliv. 597, 618
alata (Don) Oliv. 619
flava (DC.) Cl. 619
pterodonta (DC.) Cl. 619
LAMIACEAE 25, 494
Laneasagum oblongifolium Bedd. 335
Langsdorffia indica Arn. 313
Lannea Rich. 372, 376
coromandelica (Houtt.) Merr. 376
Lansium Corr. 392
anamallayanum Bedd. 390
Lantana L. 484, 489
aculeata L. 489
camara L. 489
indica Roxb. 490
wightiana Gamble 490
Lappago biflora Roxb. 756
Laportea Gaud. 85, 89
interrupta (L.) Chew 89
Lasianthera tetrandra Wall. 324
Lasianthus Jack 571, 579
acuminatus Wt. 580
Lasiosiphon Fresen. 275
eriocephalus (Grah.) Decaisne 275
glaucus Fresen. 275
Lastrea calcarata sensu Bedd. 866
cana J. Sm. 867
cana sensu Bedd. 867
cana sensu Ching 866
falciloba sensu Bedd. 866
flaccida sensu Bedd. 863
ochthodes (Kunze) Moore 865
setigera (Bl.) Hk. & Baker 863
tenericaulis (Hk.) Moore 863
Launaea Cass. 598, 619
acaulis (Roxb.) Kerr 620
LAURACEAE 23, 43
Lavandula carnosa L. f. 497
Lawia Wt. 268
Lawia Tul. 270
zeylanica Willis 269
acuminata Wt. 582
Lecanthus Wedd. 85, 89
peduncularis (Royle) Wedd. *16*, 89
wightii Wedd. 89
Lechea verticillata Willd. 123
LECYTHIDACEAE 26, 157
Ledbouria hyacinthina Roth 800
Leea L. 354
aspera Edgeworth 356
crispa L. *69*, 354, 356
edgeworthii Sant. 356
herbacea Hamilton 356
guineensis Don *69*, 354, 356
indica (Burm.) Merr. 354, 356
sambucina Willd. 356
wightii Clarke 356
LEEACEAE 18, 24, 354
Leersia Sw. 704, 738
hexandra Sw. 13, 738
Lemna arrhiza L. 791
maxima B. & H. 790
oligorrhiza Kurz 791
polyrhiza L. 790
LEMNACEAE 20, 790
LENTIBULARIACEAE 25, 562
Leonotis R. Br. 496, 502
nepetifolia (L.) R. Br. *93*, 502
Leonurus L. 496, 502
sibiricus L. 502
Lepianthes Raf. 50
umbellata (L.) Raf. *8*, 52
Lepidagathis Willd. 527, 538, 552
cristata Willd. *100*, 553
hyalina Nees 553
incurva Don 553
mucronata Nees 553
Lepidium didymum L. 189
Lepisanthes Bl. 365, 367
deficiens (W. & A.) Radlk. 368
tetraphylla (Vahl) Radlk. *72*, 367
Leptadenia R. Br. 439, 450
reticulata (Retz.) W. & A. *87*, 450
Leptochilus decurrens Bl. 15
Lepturus R. Br. 704, 739
radicans (Steud.) Camus 739
Lettsomia aggregata Roxb. 466
elliptica (Roth) Cl. 466
pomacea Roxb. 467
Leucas R. Br. 496, 503
ciliata Benth. 503
eriostoma Hk. 503
hirta (Roth) Sprengel 503
lavandulifolia Sm. 503, 504
linifolia (Roth) Sprengel 504
marrubioides Desf. 503, 504
martinicensis (Jacq.) R. Br. 503, 504
mollissima Benth. 503, 504
Leucoxylum buxifolium Bl. 195
Lichenora jerdoniana Wt. 845
Ligustrum L. 512, 513
gamblei Ramam. *95*, 513

robustum (Roxb.) Bedd. 514
roxburghii Cl. 513
LILIACEAE 18, 21, 22, 792
Limnanthemum cristatum Griseb. 475
indicum (L.) Griseb. 475
Limnophila R. Br. 515, 519
aquatica (Roxb.) Alston 520
chinensis (Osb.) Merr. 519
conferta Benth. 520
gratioloides R. Br. 520
heterophylla (Roxb.) Benth. 519
hirsuta (Benth.) Benth. 519
indica (L.) Druce *96*, 519, 520
racemosa Benth. 520
repens (Benth.) Benth. 519, 520
sessiliflora Bl. 519
sessilis (Benth.) Fischer 520
Limnophyton Miq. 629, 631
obtusifolium (L.) Miq. 13, *105*, 631
Limodorum densiflorum Lam. 831
roseum Don 826
Limonia acidissima auct. 387
arborea Roxb. 385
crenulata Roxb. 387
mauritiana Lam. 385
pentaphylla Retz. 385
pentaphylla auct. 385
Limosella diandra L. 518
LINACEAE 29, 406
Lindernia Allioni 515, 520
anagallis (Burm.) Pennell 521
antipoda (L.) Alston 521
ciliata (Colsm.) Pennell 521
cordifolia (Colsm.) Merr. 521
crustacea (L.) Muell. 521, 522, 528
dianthera Sw. 523
hirta (C. & S.) Pennell 523
hyssopoides (L.) Haines 521, 522
nummulariifolia (Don) Wetts. 520, 522
parviflora (Roxb.) Haines *96*, 521, 522
pusilla (Willd.) Bolding 521, 523
sessiliflora (Benth.) Wetts. 522
Linociera Sw. 512, 514
intermedia Wt. 514
malabarica Don *95*, 514
ramiflora (Roxb.) Don 514
Linum L. 406
mysorense Benth. 407
trigynum Roxb. 407
Liparis Rich. 810, 811, 834
elliptica Wt. 835
flavo-viridis B. & M. 835
longipes Lindl. 835
prazeri K. & P. 834, 835
viridiflora (Bl.) Lindl. 834, 835
Lipocarpha R. Br. 657, 688
argentea (Vahl) R. Br. 688
chinensis (Osb.) Kern 688
isolepis (Nees) Haines 685
sphacelata (Vahl) Kunth 688
triceps Nees 689
Lippia nodiflora (L.) Mich. 490
Litsea Lam. 43, 47
deccanensis Gamble 47, 48
floribunda (Bl.) Gamble 13, 47, 48
laevigata (Nees) Gamble *7*, 47, 48
scrobiculata Meisner 49
tomentosa Hk. 48
wightiana auct. 48
Lobelia L. 568
alsinoides Lam. 568
nicotianifolia R. & S. *101*, 568
trigona Roxb. 568
Lochnera Reich. 431
pusilla Schum. 432
rosea Endl. 432
Loesneriella Sm. 313
arnottiana (Wt.) Sm. *62*, 315
bourdillonii (Gamble) Ramam. 315
LOGANIACEAE 18, 26, 418
Lonicera L. 593, 594
leschenaultii Wall. *103*, 594
parasitica L. 308
Lophopetalum W. & A. 316, 319
wightianum Arn. 14, *63*, 319
Lophopogon Hackel 705, 739
tridentatus (Roxb.) Hackel 739
LORANTHACEAE 22, 305
Loranthus amplexifolius DC. 305
bracteatus Wall. 309
buddlejoides Desv. 309
capitellatus W. & A. 308
cordifolius Wall. 309
cuneatus Roth 309
falcatus L. f. 305
gibbosus Gamble 310
intermedius Hk. 307
lageniferus Wt. 310
longiflorus Desr. 305
loniceroides L. 308
polystachyus Wall. 307
tomentosus Roth 310
trigonus W. & A. 307
wallichianus Schultes 307

Ludwigia L. 283
adscendens (L.) Hara *53*, 283, 285
octovalvis (Jacq.) Raven *53*, 283, 285
parviflora Roxb. 285
perennis L. 283, 285
prostrata Roxb. *53*, 283, 285
repens Forst. 285
Luisia Gaud. 811, 835
macrantha B. & M. 835
teretifolia auct. 836
zeylanica Lindl. 835, 836
Luvunga W. & A. 381, 385
eleutherandra Dalz. 386
sarmentosa (Bl.) Kurz *75*, 386
Lycianthes Hassler 456, 459
bigeminata (Nees) Bitter 459
laevis (Dunal) Bitter *88*, 459
Lycopersicon lycopersicum (L.) Kars. 463
Lysimachia monnieri L. 517
LYTHRACEAE 22, 27, 29, 272

Maba nigrescens Dalz. 197
Macaranga Thouars 329, 343
peltata (Roxb.) Muell. 14, 343
Machilus glaucescens Wight 49
macrantha Nees 49
Mackaya populifolia Arn. 300
Mackenziea Nees 540, 553
caudata (Ander.) Ramam. 553
Macraea gardneriana Wt. 346
oblongifolia Wt. 347
Macrosolen (Bl.) Reich. 305, 308
capitellatus (W. & A.) Danser 308
parasiticus (L.) Danser *60*, 308
Macrothelypteris (H. Ito) Ching 857, 862
ornata (Bedd.) Ching 862
setigera (Bl.) Ching 864
torresiana (Gaud.) Ching 862, 863
Madhuca Gmelin 191, 193
indica Gmelin 193
longifolia (Koenig) Mach. 193
neriifolia (Moon) Lam. 15, 193, 194
Maerua Forsk. 183, 187
arenaria (DC.) Hk. *38*, 188
Maesa Forsk. 200, 203
dubia (Wall.) DC. 203
indica (Roxb.) DC. *43*, 203
perrottetiana DC. 203
velutina Mez 203
MAGNOLIACEAE 27, 32
Malaxis Sw. 810, 836
ensiformis Rees 840
versicolor (Lindl.) Abeyw. 836
viridiflora Bl. 835
Mallotus Lour. 329, 344
albus auct. 345
muricatus (Wt.) Muell. 344
paniculatus (Lam.) Muell. 339
philippensis (Lam.) Muell. 13, 344
resinosus (Blanco) Merr. 344
tetracoccus (Roxb.) Kurz 13, *67*, 344, 345
MALPIGHIACEAE 29, 408
Malva coromandeliana L. 153
MALVACEAE 27, 146
Malvastrum Gray 146, 153
coromandelianum (L.) Garcke 153
Mangifera L. 374, 376
axillaris Desr. 374
glauca Rottb. 318
indica L. 12, 16, 307, 308, 376
pinnata L. f. 379
Mangostana cambogia Gaertn. 126
morella Gaertn. 126
Manihot Miller 329, 345
esculenta Crantz 350
glaziovii Muell. 345
utilissima Pohl 350
Manisuris L. 703, 740
forficulata Fischer 740
Mappa peltata (Roxb.) Wt. 343
Mappia foetida Miers 325
Maranta malaccensis Burm. 762
virgata (Roxb.) Wt. 773
MARANTACEAE 22, 771
Margaritaria L. f. 330, 345
indica (Dalz.) A. Shaw 345
Mariscus Vahl 657, 661, 689
cyperinus (Retz.) Vahl 689
dubius (Rottb.) Fischer 689
maderaspatanus (Willd.) Napper 689, 690
paniceus (Rottb.) Vahl 689, 690
sieberianus Cl. 690
squarrosus (L.) Cl. 689, 690
sumatrensis Retz. 689, 690
Marsdenia volubilis (L. f.) Cooke 455
Martynia L. 561
annua L. 561
Mastixia Bl. 299
arborea (Wt.) Bedd. 299
meziana Wang. 299
Maughania macrophylla (Willd.) Kuntze 254
nilgherriensis (Baker) Li 254
strobilifera (L.) Kuntze 255
Maytenus Molina 316, 319

emarginata (Willd.) D. Hou 320
rothiana (Walp.) Ramam. 320
wightiana Babu 320
Mecardonia R. & P. 515, 523
dianthera (Sw.) Pennell 523
procumbens (Mill.) Small *96*, 523
Meiogyne Miq. 34, 35, 37
pannosa (Dalz.) Sinclair 38
ramarowii (Dunn) Gandhi 38
Melanocenchris Beauv. 705, 740
jacquemontii J. & S. 740
royleana Steudel 740
Melanthesa retusa (Dennst.) Kostel. 333
Melanthium indicum L. 798
Melastoma L. 286
malabathricum L. *54*, 286
MELASTOMATACEAE 26, 27, 286
Melhania Forsk. 139, 142
incana W. & A. *29*, 142
Melia L. 390, 394
azadirachta L. 393
baccifera Roth 394
composita Willd. 395
dubia Cav. 394
MELIACEAE 30, 389
Meliosma Bl. 69
arnottiana (Wt.) Walp. 69
pinnata (Roxb.) Walp. *13*, 69
pungens (W. & A.) Walp. 71
simplicifolia (Roxb.) Walp. *13*, 69
wightii Brandis 71
Melocanna baccifera (Roxb.) Kurz 742
bambusoides Trin. 742
Melochia L. 139, 142
corchorifolia L. 143
cordata Burm. 155
Melothria amplexicaulis (Lam.) Cogn. 179
maderaspatana (L.) Cogn. 178
perpusilla (Bl.) Cogn. 181
perpusilla auct. 181
Memecylon L. 286, 288
amplexicaule Roxb. 288
augustifolium Wt. *54*, 288
edule Roxb. 288
malabaricum (Cl.) Cogn. *54*, 288
talbotianum Brandis 288
umbellatum Burm. *54*, 288
Meniscium proliferum (Retz.) Sw. 858
MENISPERMACEAE 23, 28, 29, 64
Menispermum cocculus L. 66
hirsutum L. 67
japonicum Thunb. 68
peltatum Lam. 67
Mentha stellata Lour. 500
MENYANTHACEAE 18, 25, 475
Menyanthes cristata Roxb. 475
indica L. 475
Merremia Endl. 464, 472
emarginata (Burm.) Hall. f. 473
gangetica (L.) Cufod. 473
hastata Hall. f. 473
tridentata (L.) Hall. f. 473
umbellata (L.) Hall. f. 473
vitifolia (Burm.) Hall. f. 473, 474
Mesua L. 124, 128
coromandeliana Wt. 128
ferrea L. 14, 128
pedunculata Wt. 128
speciosa Choisy 128
thwaitesii P. & T. 129
Meyenia Nees 538, 554
hawtayneana (Wall.) Nees 554
Meyna Link 571, 580
laxiflora Robyns 580
Mezoneuron Desf. 215, 222
cucullatum (Roxb.) W. & A. *49*, 222
Michelia L. 32
champaca L. *4*, 14, 34
Micranthus oppositifolius Wendl. 557
Micrargeria R. & P. 515, 524
wightii Benth. 524
Microcarpaea spathulata Hk. 519
Microchloa R. Br. 704, 741
indica (Lf.) Beauv. 741
Microcos tomentosa Sm. 136
Microelus roeperianus Wt. 332
Micropera maculata Dalz. 850
viridiflora Dalz. 851
Microrhynchus glabra (DC.) Wt. 620
Micropyxis tenella (Duby) Wt. 205
Microstylis versicolor Lindl. 836
Microtropis Meisner 316, 320
stocksii Gamble 15, 322
Milium cimicinum L. 707
compressum Sw. 712
globosum Thunb. 736
Miliusa Leschenault 35, 38
velutina (Dunal) Hk. & Th. 38
wightiana Hk. & Th. 38
Milletia thyrsiflora Benth. 248
Millingtonia arnottiana Wt. 69
pinnata Roxb. 69
pungens W. & A. 69
simplicifolia Roxb. 69

Milnea roxburghiana (Miq.) W. & A. 392
Mimosa L. 225, 231
amara Roxb. 230
chinensis Osb. 230
chundra Rottl. 226
cineraria L. 232
concinna Willd. 228
dulcis Roxb. 232
farnesiana L. 226
ferruginea (DC.) Roxb. 227
lebbeck L. 230
leucophloea Roxb. 227
marginata Lam. 230
monadelpha Roxb. 232
nilotica L. 227
odoratissima L. f. 230
pennata L. 228
pudica L. 231
rugata Lam. 228, 229
sinuata Lour. 228
stipulata Roxb. 230
suma Roxb. 228
torta Roxb. 229
xylocarpa Roxb. 233
MIMOSOIDEAE 215, 225
Mimusops L. 191, 194
elengi L. *40*, 194
Miquelia Meisner 324, 325
dentata Bedd. *65*, 325
Mirabilis jalapa L. 92
Mirasolia diversifolia Hemsely 625
Mitracarpus Zucc. 571, 580
scaber Zucc. 580, 581
verticillatus (Schum.) Vatke 581
Mitragyna Korthals 571, 581
parviflora (Roxb.) Korth. 581
Mitrasacme Labill. 418, 420
malaccensis Wt. 420
polymorpha auct. 420
pygmaea R. Br. 420
Moacurra gelonioides Roxb. 326
Modecca bracteata Lam. 179
palmata Lam. 168
MOLLUGINACEAE 23, 94
Mollugo L. 95
cerviana (L.) Ser. *17*, 95
lotoides (L.) Kuntze 95
oppositifolia L. 95
pentaphylla L. *17*, 95, 97
Momordica L. 174. 177
charantia L. 16, 178
dioica Willd. 177
Moniera Browne 517
cuneifolia Mich. 517
Monocera munronii Wt. 129
Monochilus affine Wt. 855
longilabre Lindl. 855
Monochoria Presl 791
vaginalis (Burm.) Presl 791
Monosis wightiana DC. 626
MORACEAE 18, 23, 75
Morinda L. 571, 581
tomentosa Roth 581
tinctoria Roxb. 581, 582
Morus alba L. 84
indica L. 84
Mucuna Adanson 234, 259
monosperma Wt. 259
pruriens (L.) DC. 259
prurita Hk. 259
Mukia Arn. 176, 178
maderaspatana (L.) Roem. 178
scabrella (L. f.) Arn. 178
Muldera trichostachya Miq. 54
Mundulea Benth. 234, 259
sericea (Willd.) Cheval 260
suberosa Benth. 260
Munnicksia laurifolia Dennst. 164
Munronia Wt. 390, 395
pinnata (Wall.) Harms *76*, 395
wallichii Wt. 395
Murdannia Royle 641, 647
elata (Vahl) Brueck. 647, 648
lanuginosa (Cl.) Brueck. 647, 648
malabarica (L.) Brueck. 648
nudiflora (L.) Brenan 647, 648
pauciflora (Wt.) Brueck. 648, 649
semiteres (Dalz.) Sant. 647, 649
simplex (Vahl) Brenan 647, 649
spirata (L.) Brueck. 648, 649
vaginata (L.) Brueck. 649
wightii R. & K. 649
Murraya L. 381, 386
exotica L. 386
paniculata (L.) Jack. 386
MUSACEAE 21, 760
Musa acuminata Colla 761
balbisiana Colla 761
paradisiaca auct. 761
sapientum L. 761
superba Roxb. 761
Mussaenda L. 571, 582
frondosa L. 582
laxa (Hk.) Gamble *102*, 582

Mycetia Reinwardt 571, 582
acuminata (Wt.) Kuntze 582
Myriophyllum L. 270
oliganthum (W. & A.) Muell. *50*, 270
indicum Willd. 270
intermedium DC. 270
intermedium auct. 270
Myristica Gronovius 40, 42
attenuata Hk. & Th. 42
beddomei King 42
contorta Warb. 42
corticosa Bedd. 42
dactyloides Gaertn. *6*, 14, 42
MYRISTICACEAE 24, 40
Myrobalanus bellirica Gaertn. 294
chebula Gaertn. 294
MYRSINACEAE 24, 25, 28, 200
MYRTACEAE 26, 277
Myrtus bracteata Willd. 278
caryophyllata L. 280
cumini L. 281
laurina Retz. 198
zeylanica L. 283

NAJADACEAE 21, 636
Najas L. 60, 636
falciculata Braun 638
graminea Del. 638
indica (Willd.) Cham. *107*, 638
lacerata Rendle 638
minor All. 638
Naravelia DC. 60
zeylanica (L.) DC. *11*, 63
Nardus indica L. f. 741
thomaea L. f. 743
Naringi Adanson 379, 386
crenulata (Roxb.) Nicols. 387
Nauclea cordifolia Roxb. 572
elliptica auct. 584
parvifolia Roxb. 581
purpurea Roxb. 584
Neanotis Lewis 571, 583
foetida (Dalz.) Lewis 583
quadrilocularis (Thw.) Lewis 583
Nechamandra alternifolium (Roxb.) Thw. 634
Nelumbium nelumbo (L.) Druce 58
speciosum Willd. 58
Nelumbo Adanson 58
nucifera Gaertn. 12, 58
NELUMBONACEAE 18, 27, 58
Nemedra elaeagnoidea Juss. 392
Neolansium Harms 392
Neolitsea Merrill 43, 48
scrobiculata (Meisner) Gamble *7*, 49
Neonauclea Merrill 571, 583
purpurea (Roxb.) Merrill *102*, 584
Nepeta indica L. 498
malabarica L. 498
Nephelium longana (Lam.) Camb. 366
stipulaceum Bedd. 368
Nephrodium abruptum sensu Bedd. 864, 865
articulatum Houlst. & Moore 864, 865
didymosorum Parish ex Bedd. 861
falcilobum Hk. 866
glandulosum Bl. 864
malabariense Fee 861
molle sensu Hk. 860
molle Bedd. 861
parasiticum Cl. 861
pennigerum sensu Bedd. 864, 865
procurrens (Mett.) Bak. 861
procurrens sensu Bedd. 860
prolixum sensu Baker 865
pteroides sensu J. Sm. 858
tectum Wall. ex Bedd. 861, 862
tenericaule Hk. 862, 863
terminans Hk. 858
Nerium L. 427, 435
indicum Miller 435
odorum Soland. 435
oleander L. 435
Nervilia Gaud. 810, 836
aragoana Gaud. 837
carinata (Roxb.) Schl. 837
monantha B. & M. 838
plicata (Andr.) Schl. 837
prainiana (K. & P.) S. & S. 837
Neurocalyx Hk. 571, 584
calycinus (Benn.) Robins. 584
hookerianus Wt. 584
wightii Arn. 584
Nicandra Adanson 456, 460
physalodes (L.) Gaertn. 460
Nicotiana tabacum L. 16, 463
Niebuhria arenaria DC. 188
Nilgirianthus Bremek. 540, 554
barbatus (Nees) Bremek. *100*, 554, 555
ciliatus (Nees) Bremek. 554, 555
heyneanus (Nees) Bremek. 534, 554, 55
neilgherrensis (Bedd.) Bremek. 555
warrensis (Dalz.) Bremek. 15, 555, 556
Nimmoia lawii Wt. 392
Norisca mysurensis (W. & A.) Wt. 128

Nothapodytes Bl. 324, 325
foetida (Wt.) Sleumer *65*, 325
Nothopegia Bl. 374, 377
beddomei Gamble *74*, 377
colebrookeana Bl. 378
colebrookeana auct. 377
dalzellii Gamble 377
heyneana (Hk.) Gamble 377
racemosa (Dalz.) Ramam. 377
travancorica Hk. 377
Notonia wightii W. & A. 256
NYCTAGINACEAE 22, 91
Nymphaea L. 57
nelumbo L. 58
nouchali Burm. 57, 58
pubescens Willd. 12, 57, 58
stellata Willd. 57
NYMPHAEACEAE 18, 26, 57
Nymphoides Seguier 475
cristata (Roxb.) Kuntze 12, *90*, 475
indica (L.) Kuntze 12, *90*, 475

Oberonia Lindl. 810, 838
brachyphylla B. & M. 838
brunoniana Wt. 838
ensiformis (Rees) Lindl. 838
ferruginea Parish 840
josephi Sald. *127*, 838, 840
lindleyana Wt. 840
santapaui Kapadia 838, 840, Pl. 17
Ochlandra Thw. 703, 741
rheedii (Kunth) Benth. & Hk. 741
scriptoria (Dennst.) Fischer 15, 741
Ochna L. 114
beddomei Gamble 116
gamblei Brandis 116
obtusata DC. *22*, 116
squarrosa auct. 116
OCHNACEAE 28, 114
Ocimum L. 496, 504
adscendens Willd. 505
americanum L. 505
canum Sims 505
diffusum Benth. 501
molle Aiton 506
sanctum L. 505
viscosum Roth 501
Ocotea paniculata Nees 50
Odina wodier Roxb. 376
Oenothera octovalvis Jacq. 285
OLACACEAE 27, 29, 30, 299
Olax L. 299, 301
wightiana W. & A. *58*, 301
Oldenlandia L. *102*, 571, 584
affinis (R. & S.) DC. 585
aspera (Roth) DC. 585
auriculata (L.) Schum. 585
caerulea (W. & A.) Gamble 585, 586
corymbosa L. 585, 586
dichotoma (Roth) Hk. 585
diffusa Roxb. 586
herbacea (L.) Roxb. 585, 586
nitida (W. & A.) Gamble 585, 586
repens L. 576
wightii Hk. 585, 586
Olea L. 512, 514
dioica Roxb. *95*, 514
roxburghii Wall. 513
OLEACEAE 25, 29, 510
Oligopholis tubulosa Wt. 534
OLINIACEAE 574
ONAGRACEAE 26, 283
Onychium flavescens Bl. 844
Ophelia corymbosa Griseb. 427
Ophiopogon Ker-Gawler 792, 799
indicus Wt. 799
intermedius Don 799
Ophiorrhiza L. 571, 587
hirsutula Hk. *102*, 587
Ophiurus radicans Steudel 739
OPILIACEAE 24, 301
Oplismenus Beauv. 706, 742
burmannii (Retz.) Beauv. 742
compositus (L.) Beauv. 742
Opuntia L. 93
dillenii (K.-G.) Haw. 93
monacantha (Willd.) Haw. 93
vulgaris Mill. 93
ORCHIDACEAE 22, 809
Orchis plantaginea Roxb. 834
platyphyllos auct. 834
platyphyllos Willd. 834
roxburghii Persoon 834
susannae L. 844
viridiflora Sw. 834
Origanum benghalense Burm. 507
Ormosia Jack 234, 260
travancorica Bedd. 260
OROBANCHACEAE 25, 532
Oropetium Trin. 704, 742
thomacum (L.) Trin. 743
Orthosiphon Benth. 496, 505
diffusus (Benth.) Benth. 501
rubicundus (Don) Benth. 505

Oryza L. 704, 743
rufipogon Griff. 13, *111*, 743
sativa L. 16, 743
Osbeckia L. 286, 289
cupularis W. & A. *54*, 289
hispidissima Wt. *54*, 289, Pl. 6
leschenaultiana Wt. 289
truncata W. & A. *54*, 289
Osmunda regalis L. 15
Ostodes zeylanicus (Thw.) Muell. 340
Osyris L. 302
arborea DC. 302
lanceolata DC. 302, 304
peltata Roxb. 343
quadripartita Decaisne *59*, 302, 304
wightiana Wt. 302
Otonephelium Radlk. 365, 368
stipulaceum (Bedd.) Radlk. *72*, 368
Ottelia Persoon 633, 634
alismoides (L.) Persoon 13, 634
OXALIDACEAE 18, 29, 397
Oxalis L. 397, 399
corniculata L. *77*, 399
sensitiva L. 399

Pajanelia DC. 534, 536
longifolia (Willd.) Schum. 536
rheedii Wt. 536
PANDANACEAE 20, 777
Pandanus Parkinson 777
amaryllifolius Roxb. 781
canaranus Warb. *116*, 778, 780
fascicularis Lam. *116*, 778, 780
foetidus Roxb. 781
furcatus Roxb. 778, 780
kaida Kurz 778, 779
odoratissimus L. f. 780
spurius Miq. 781
tectorius Parkinson 780
thwaitesii Mart. *116*, 778, 780
veitchii Hort. 781
Panicum L. 705, 743
abludens R. & S. 723
accrescens Trin. 720
adscendens H. B. K. 723
asperum Koenig 750
brevifolium L. 744
burmannii Retz. 742
ciliare Retz. 723
compositum L. 742
colonum L. 726
crusgalli L. 726
eruciforme Sm. 713
flavidum Retz. 745
flexuosum Retz. 744
geminatum Forsk. 745
intermedium (R. & S.) Roth 752
interruptum Willd. 751
longiflorum Retz. 724
miliiforme Presl 714
oxyphyllum Steudel 720
pallide-fuscum Schumach. 753
paludosum Roxb. 744
patens L. 721
psilopodium Trin. 744
repens L. 744, 745
semialatum R. Br. 707
simpliciusculum Steudel 717
spinescens R. Br. 750
stagninum Retz. 726
tenellum Roxb. 745
tomentosum Roxb. 752
tripheron Schultes 744, 745
PAPAVERACEAE 27, 71
Paracalyx Ali 235, 260
scariosa (Roxb.) Ali 260
Paramignya Wt. 379, 387
monophylla Wt. *75*, 387
Paratropia venulosa W. & A. 412
wallichiana W. & A. 414
Parietaria indica L. 91
zeylanica L. 91
Parkinsonia aculeata L. 225
Parnassia L. 210
mysorensis W. & A. 15, *47*, 211
Parsonsia R. Br. 429, 435
laevigata (Moon) Alston 436
spiralis Don 436
Parthenium L. 598, 620
hysterophorus L. 620
Paspalidium Stapf 706, 745
flavidum (Retz.) Camus 745
geminatum (Forsk.) Stapf 745
Paspalum L. 706, 746
chinense Nees 724
compactum Roth 746
conjugatum Berg. 746
granulare Sprengel 723
longiflorum Retz. 724
orbiculare Forst. 746, 747
pedicellare Hk. 723
scrobiculatum L. 746, 747
Passiflora L. 168
calcarata Mast. 169

foetida L. 169
subpeltata Ortega 169
PASSIFLORACEAE 28, 167
Pastinca rigens (DC.) Wt. 416
Paullinia asiatica L. 388
Pavetta L. 572, 587
indica L. 587, 588
nilagirica Bedd. 591
thomsonii Bremek. *102*, 587
tomentosa Sm. 587, 588
Pavonia Cavan. 148, 153
odorata Willd. 154
zeylanica (L.) Cavan. *30*, 154
Pecteilis susannae (L.) Rafin. 844
PEDALIACEAE 25, 561
Pedicularis L. 515, 524
zeylanica Benth. 15, *96*, 524
Pedilanthus tithymaloides (L.) Poit. 350
Peliosanthes Andrews 792, 799
humilis Andrews 799
neilgherrensis Wt. 799
courtallensis Wt. 799
teta Andrews 799, 800
Pellionia Gaud. 85, 90
heyneana Wedd. *16*, 90
Pennisetum Rich. 703, 747
cenchroides Pers. 747
hohenackeri Steudel 747
typhoides S. & H. 16, 747
Pentaptera tomentosa DC. 293
Peperomia R. & P. 50, 52
heyneana Miq. 52
portulacoides (Lam.) Dietr. 52, 53
reflexa Dietr. 52, 53
Peplis indica Willd. 274
Pergularia L. 439, 450
daemia (Forsk.) Chiov. 451
extensa (Jacq.) Br. 451
Periploca emetica Retz. 452
indica L. 448
sylvestris Retz. 448
tunicata Retz. 446
Peristrophe Nees 540, 556
bicalyculata (Retz.) Nees 556
Peristylus Bl. 810, 840
aristatus Lindl. 841
goodyeroides (Don) Lindl. 841
exilis Wt. 841
lancifolius Rich. 841
plantagineus Lindl. 841
robustior Wt. 841
secundus (Lindl.) Rathk. 841
spiralis Rich. 841
Perotis Aiton 703, 747
indica (L.) Kuntze 748
Persea Miller 45, 49
macrantha (Nees) Kosterm. *7*, 49
Phalaenopsis Bl. 811, 842
decumbens (Griff.) Holttum 842
mysorensis Sald. *128*, 842
wightii Reich. 842
Phalangium parviflorum (Dalz.) Wt. 795
Phalaris hispida Thunb. 709
muricata Forsk. 756
Phanera phoenicea (W. & A.) Benth. 217
Pharnaceum cerviana L. 95
depressum L. 99
Phaseolus L. 266
calcaratus Roxb. 267
radiatus L. 267
trilobus auct. 267
vexillatus L. 268
Phaulopsis Willd. 540, 557
dorsiflora (Retz.) Sant. 557
Phegopteris ornata J. Sm. 862
Phillyrea robusta Roxb. 513
Phlebophyllum Nees 540, 557
canaricum (Bedd.) Bremek. 15, 557
Phleum indicum Houtt. 737
Phlogacanthus latifolius Wt. 548
Phlomis hirta Roth 503
linifolia Roth 504
nepetifolia L. 502
Phoberos crenatus W. & A. 164
Phoebe Nees 43, 49
cathia (Don) Gandhi *7*, 50
paniculata Nees 50
Phoenix L. 774, 776
humilis Royle 13, 776
sylvestris (L.) Roxb. 12, 776, 777
Pholidota Lindl. 811, 843
imbricata auct. 843
pallida Lindl. 843
Phragmites Trin. 704, 748
karka (Retz.) Steudel 748
Phrynium Willd. 771
capitatum Willd. 773
parviflorum Roxb. 771
placentarium (Lour.) Merr. *115*, 771
pubinerve Bl. 773
spicatum Roxb. 773
virgatum Roxb. 773
Phyla Lour. 484, 490
nodiflora (L.) Greene 13, *92*, 490

Phyllanthus L. 329, 346
bacciformis L. 349
fraternus Webster 346
gardnerianus (Wt.) Baill. 346
leprocarpus Wt. 347
macraei Muell. 346
maderaspatensis L. 346, 347
niruri auct. 346
patens Roxb. 333
reticulatus Poir. 343
retusus Dennst. 333
simplex Retz. 347
urinaria L. 346, 347
virgatus Forst. 346, 347
virosus Willd. 348
Phyllodes placentaria Lour. 771
Physalis L. 456, 460
minima L. *88*, 460
somnifera L. 463
Piliostigma racemosa (Lam.) Benth. 217
Pimpinella L. 414, 417
heyneana (DC.) Kurz *83*, 417
monoica Dalz. 417
wallichiana (Miq.) Gandhi *83*, 417
Pinanga Bl. 774, 777
dicksonii (Roxb.) Scheffer 14, 777
Piper L. 50, 53
argyrophyllum Miq. 53
attenuatum Miq. 54
hymenophyllum Miq. 53
nigrum L. 53, 54
portulacoides Lam. 53
subpeltatum Willd. 52
sylvestre auct. 54
trichostachyon (Miq.) DC. 53, 54
trioicum Roxb. 53, 54
umbellatum L. 52
PIPERACEAE 22, 50
Piptostylis indica Dalz. 383
Pistacia oleosa Lour. 369
Pistia L. 781, 788
stratiotes L. 12, 788
Pithecellobium Mart. 225, 231
bigeminum auct. 232
dulce (Roxb.) Benth. 232
monadelphum (Roxb.) Kosterm. 232
PITTOSPORACEAE 28, 205
Pittosporum Solander 205
dasycaulon Miq. *45*, 207
floribundum W. & A. *45*, 207
napaulense auct. 207
Plaso monosperma (Lam.) Kuntze 238
Plantanthera Rich. 810, 844
susannae (L.) Lindl. 844
Plecospermum Trecul 77, 84
spinosum (Willd.) Trecul *15*, 84
Plectranthus L'Herit. 496, 499, 506
caninus Roth 499
incanus Link 506
mollis (Aiton) Sprengel 506
rubicundus Don 505
stocksii Hk. 506
Plectronia L. 574
didyma (Gaertn.) Kurz 575
parviflora (Lam.) Bedd. 575
rheedii (DC.) Bedd. 575
Pleopeltis nuda Hk. 14
Plumeria L. 427, 436
acuminata R. Br. 436
acutifolia Poiret 436
rubra L. 436
PLUMBAGINACEAE 25, 112
Plumbago L. 112
auriculata Lam. 114
zeylanica L. 112
Poa atrovirens Desf. 729
bifaria Vahl 728
diandra Roxb. 729
diarrhena Schultes 729
riparia Willd. 730
tenuifolia Rich. 730
uniloides Retz. 730
viscosa Retz. 730
POACEAE 20, 21, 701
Podanthera pallida Wt. 826
PODOSTEMACEAE 22, 269
Poeciloneuron indicum Bedd. 14
Pogonatherum Beauv. 703, 748
contortum Brongn. 750
paniceum (Lam.) Hackel 749
Pogonia prainiana K. & P. 837
Pogostemon Desf. 496, 500, 506
benghalensis (Burm.) Kuntze 506, 507
mollis Benth. 506, 507
paniculatus (Willd.) Benth. 506, 507, 508
pubescens Benth. 506, 507
plectranthoides Desf. 507
purpurascens Dalz. 506, 507
Pollia secundiflora (Bl.) Bakh. 641
sorsogonensis Endl. 641
Pollinia fulva Sprengel 716
Poloa wightiana DC. 620
Polyalthia Bl. 34, 35, 39
cardiopetala Dalz. 37

fragrans (Dalz.) Bedd. *5*, 39
longifolia (Sonn.) Thw. 39
Polycarpaea Lam. 97, 99
corymbosa (L.) Lam. *18*, 99
Polycarpon L. 97, 99
depressum T. & G. 99.
loeflingiae (W. & A.) Edge. & Hk. 99
prostratum (Forsk.) A. & S. *18*, 99, 100
tetraphyllum L. 100
Polydontia ceylanica Wt. 213
Polygala L. 410
arvensis Willd. *81*, 410
chinensis auct. 410
elongata Willd. 410, 412
persicariifolia DC. *81*, 410, 412
POLYGALACEAE 29, 410
POLYGONACEAE 23, 108
Polygonum L. 108
barbatum L. *20*, 109, 112
chinense L. 109
dichotomum Bl. 111
donii Wt. 111
flaccidum auct. 111
glabrum Willd. 13, 109
hydropiper L. *20*, 109, 111
pedunculare Meisner *20*, 109, 111
plebeium R. Br. 109, 111
pulchrum Bl. *20*, 109, 112
tomentosum Willd. 111
stagninum Meisner 109, 112
Polymnia abyssinica L. f. 617
Polypodium dentatum Forsk. 860
laciniatum Burm. 789
molle Jacq. 860
ornatum Wall. ex Bedd. 862
parasiticum L. 861
pteroides Retz. 859
tenericaule Hk. 863
Polystachya Hk. 811, 844
flavescens (Bl.) Sm. 844
purpurea Wt. 844
wightii Reich. 844
Polystichum torresianum Gaud. 863
Pongamia canarensis Dalz. 247
glabra Vent. 248
pinnata (L.) Pierre 248
PONTEDERIACEAE 21, 791
Pontederia plantaginea Roxb. 791
vaginalis Burm. 791
Porpax Lindl. 811, 845
jerdoniana (Wt.) Rolfe 845
reticulata Lindl. 845, Pl. 18
Portulaca L. 100
oleracea L. 100
pilosa L. 100
tuberosa Roxb. 100
PORTULACACEAE 100
Posoqueria longispina Roxb. 592
Potamogeton L. 638
indicus Roxb. 638
javanicus Hassk. 640
nodosus Poiret *108*, 638, 640
octandrus Poiret 640
pectinatus L. *108*, 638, 640
perfoliatus L. *108*, 638, 640
POTAMOGETONACEAE 21, 638
Pothomorphe Miquel 50
subpeltata (Willd.) Miq. 52
Pothos L. 781, 788
pertusus Roxb. 789
scandens L. 14, 788
Pouzolzia Gaud. 85, 90
indica (L.) Gaud. 91
nilghirensis Wt. 90
scabra Wt. 91
wightii Benn. *16*, 90
zeylanica (L.) Benn. 90, 91
Premna L. 484, 491
coriacea Clarke *92*, 491
odorata Blanco 491
tomentosa Willd. 491
Prenanthes acaulis Roxb. 620
PRIMULACEAE 25, 28, 205
Pristimera indica (Willd.) Sm. 315
Procris peduncularis Royle 89
Pronephrium Presl 857, 864
articulatum (Houst. & Moore) Holttum 864
Prosopis L. 225, 232
cineraria (L.) Druce 232
spicigera L. 232
Prosorus indicus Dalz. 345
PROTEACEAE 24, 295
Protium caudatum W. & A. 371
Prunella indica Burm. 497
Prunus L. 211
acuminata Mich. 213
ceylanica (Wt.) Miq. *48*, 213
Pseuderanthemum Radlk. 540, 557
malabaricum (Cl.) Gamble 558
Pseudarthria W. & A. 235, 261
viscida (L.) W. & A. 261
Pseudechinolaena Stapf 706, 749
polystachya (H. B. K.) Stapf 749

Pseudocyclosorus Ching 857, 865
ochthodes (Kunze) Holttum 865
repens (Hope) Ching 866
Pseudopogonatherum Camus 705, 749
contortum (Brongn.) Camus 750
Pseudoraphis Griff. 706, 750
aspera (Koenig) Pilger 750
spinescens (R. Br.) Vickery 750
Pseudostachyum Munro 754
Psidium L. 278
guajava L. 280
Psychechilos gracile Breda 854
Psychotria L. 572, 588
canarensis Talbot 588
dalzellii Hk. *102*, 588
flavida Talbot 588, 589
nigra (Gaertn.) Alston 588, 589
octosulcata Talbot 588, 589
ophioxyloides Wall. 576
thwaitesii Hk. 589
truncata Wall. 588, 589
Psydrax dicoccos Gaertn. 575
Ptelea arborea Blanco 367
viscosa (Jacq.) L. 367
Pteris interrupta Willd. 859
Pterocarpus Jacq. 234, 261
marsupium Roxb. 12, 16, 261, 308
Pterolobium W. & A. 215, 223
hexapetalum (Roth) S. & W. 11, 223
indicum Rich. 223
lacerans auct. 223
Pterospermum Schreber 139, 143
acerifolium Willd. *29*, 143
diversifolium Bl. 143
Pulicaria Gaertn. 598, 620
wightiana (DC.) Cl. 620
Pycnospora W. & A. 235, 261
hedysaroides Baker 262
lutescens (Poir.) Schindler 262
Pycreus Beauv. 657, 661, 691
albomarginatus Nees 692
capillaris Nees 692
diaphanus (R. & S.) H. & K. 691
globosus (Alli.) Reich. 691, 692
hyalinus Domin 694
latespicatus (Boeck.) Cl. 691
macrostachyos (Lam.) Raynal 691, 692
nitens (Retz.) Nees 693
odoratus Urban 693
polystachyos (Rottb.) Beauv. 691, 693
pumilus (L.) Nees 691, 693
puncticulatus (Vahl) Nees 693
sanguinolentus (Vahl) Nees 691, 694
stramineus Clarke 691, 694
sulcinus Clarke 693
Pygeum acuminatum 213
gardneri Hk. 213
sisparense Gamble 213
wightianum Muell. 213
zeylanicum Gaertn. 213

Quamoclit phoenicea (Roxb.) Choisy 471
Queenslandiella Domin 657, 661, 694
hyalina (Vahl) Ballard 694
Quisqualis indica L. 294

Radermachera Z. & M. 534, 536
xylocarpa (Roxb.) Schum. *99*, 536
Randia L. 571, 590
brandisii Gamble 593
dumetorum (Retz.) Poir. 592
longispina (Roxb.) DC. 592
rugulosa (Thw.) Hk. 590
spinosa (Thunb.) Poir. 592
uliginosa (Retz.) DC. 593
RANUNCULACEAE 23, 60
Raphis orientalis Desv. 717
Reichardia decapetala Roth 218
hexapetala Roth 223
Reinwardtia Dumortier 406, 407
indica Dumortier 407
trigyna Planchon 407
Reinwardtiodendron Koord. 392
anamallayanum (Bedd.) Sald. 392
Remusatia Schott 782, 788
vivipara (Roxb.) Schott *117*, 788, Pl. 13
vivipara auct. 784
Reissantia Halle 313, 315
indica (Willd.) Halle *62*, 315
RHAMNACEAE 23, 26, 29, 350
Rhamnus circumscissus L. f. 353
myrtinus Burm. 353
oenoplia L. 353
parviflora Klein 351
xylopyrus Retz. 354
Rhaphidophora Hassk. 781, 789
laciniata (Burm.) Merr. 14, 789
pertusa (Roxb.) Schott 789
Rhapidospora glabra (Roxb.) Nees 551
Rhinanthus indica L. 518
Rhinacanthus Nees 540, 558
communis Nees 558
nasutus (L.) Kurz 558
RHIZOPHORACEAE 27, 297

Rhus L. 372, 378
cobbe L. 365
mysorensis Don 11, *74*, 378
sinuata Thunberg 378
Rhynchoglossum Bl. 528, 530
obliquum Bl. 531
notonianum (Wall.) Burtt *97*, 531
Rhynchosia Lour. 235, 262
cyanosperma Baker 262
hirta (Andr.) M. & V. 262
rufescens (Willd.) DC. 262
villosa (Meisner) Druce 262
Rhynchospora Vahl 657, 695
aurea Vahl 695
corymbosa (L.) Britt. 695
Rhynchostylis Bl. 811, 845
latifolia Fischer 847
retusa (L.) Bl. 13, 846
Rhynchotechum Bl. 528, 531
permolle (Nees) Burtt 531
Ricinus L. 329, 347
communis L. 347
Rikliella Raynal 657, 658, 695
kernii (Raymond) Raynal 695, 696
squarrosa (L.) Raynal 695, 696
Rinorea Aublet 167
bengalensis (Wall.) Kuntze *33*, 167
Rivea Choisy 464, 474
cuneata Wt. 464
hypocrateriformis (Desr.) Choisy 474
pomacea Wt. 467
Robinia mitis L. 248
Rondeletia asiatica L. 591
Rosa L. 211, 213
multiflora Thunb. 213
ROSACEAE 27, 211
Rostellularia crinita Nees 551
gracilis Wt. 559
Rotala L. 272, 274
densiflora (Roth) Koehne 274
indica (Willd.) Koehne 274
leptopetala (Bl.) Koehne 274
rotundifolia (Don) Koehne 274
roxburghiana Wt. 274
verticillaris L. 274, 275
Rothia Persoon 234, 263
indica (L.) Druce 263
trifoliata Persoon 263
Rottlera alba Roxb. 345
peltata Wt. 345
tetracocca Roxb. 345
Rotula Lour. 477, 482
aquatica Lour. 15, *91*, 482
lycioides (Mart.) Johns. 483
Rourea Aublet 363
minor (Gaertn.) Alston *71*, 363
santaloides W. &. A. 363
Rubia L. 571, 590
cordifolia L. 590
munjista Roxb. 590
RUBIACEAE 24, 569
Rubus L. 211, 214
ellipticus Sm. *48*, 214
gowreephul Roxb. 214
fockei Gandhi *48*, 214
fulvus Focke 214
wallichianus W. & A. 214
Ruellia anagallis Burm. 521
antipoda L. 521
dorsiflora Retz. 557
erecta Burm. 547
latebrosa Roth 549
prostrata Poiret 547
salicifolia Vahl 550
Rungia Nees 540, 558
linifolia Nees 559
parviflora Nees 559
pectinata (L.) Nees *100*, 559
repens (L.) Nees 559
RUTACEAE 28, 30, 379

SABIACEAE 29, 69
Saccharum L. 703, 750
officinarum L. 751
paniceum Lam. 749
spontaneum L. 751
Sacciolepis Nash 704, 751
indica (L.) Chase 751
interrupta (Willd.) Stapf 751
Saccolabium flabelliforme B. & M. 830
pulchellum (Wt.) Fischer 830
speciosum Wt. 813
Sageretia Brong. 351
parviflora (Klein) Don *68*, 351
Sagittaria L. 629, 632
obtusifolia L. 631
guayanensis H. B. K. 632
sagittifolia L. *105*, 632
sinensis Sims 632
Salacia L. 313, 316
macrosperma Wt. *62*, 316
SALICACEAE 22, 181
Salix L. 181
tetrasperma Roxb. *37*, 183

Salmalia S. & E. 145
insignis (Wall.) S. & E. 146
malabarica (DC.) S. & E. 14, 145
SALVADORACEAE 29, 322
Salvia L. 496, 508
coccinea Buc. 508
Samanea saman (Jacq.) Merr. 233
SAMYDACEAE 18
Sansevieria Thunb. 801, 803
roxburghiana S. & S. 803
zeylanica (L.) Willd. 804
zeylanica Roxb. 803
SANTALACEAE 23, 302
Santalum L. 302, 304
album L. 12, 16, *59*, 304
SAPINDACEAE 23, 29, 30, 363
Sapindus L. 365, 368
deficiens W. & A. 368
emarginata Vahl 369
laurifolia Vahl *72*, 368, 369
microcarpa W. & A. 69
tetraphylla Vahl 368
trifoliata L. 369
trifoliata auct. 368
SAPOTACEAE 24, 25, 191
Saprosma Bl. 572, 590
glomerata (Gardn.) Bedd. 591
indica Dalz. 591
Saraca L. 215, 223
asoca (Roxb.) De Wilde 224
indica auct. 223
Sarcanthus Lindl. 811, 846
pauciflorus Wt. 846
peninsularis Dalz. 846
Sarcochilus dalzellianus Sant. 851
Sarcostemma R. Br. 437, 451
acidum (Roxb.) Voigt 11, 451
brevistigma W. & A. 451
intermedium Decaisne 451
Sarcostigma W. & A. 324, 326
kleinii W. & A. *65*, 326
Satyrium Sw. 810, 846
nepalense Don 15, 847
Sauromatum Schott 781, 789
guttatum (Wall.) Schott 789
pedatum (Willd.) Schott 789
SAXIFRAGACEAE 210
Scepa lindleyana Wt. 331
Schefflera F. & F. 412
venulosa (W. & A.) Harms 13, 412
wallichiana (W. & A.) Harms 13, *82*, 412, 414
Schleichera Willd. 365, 369
oleosa (Lour.) Oken 369
trijuga Willd. 369
Schmidelia Bochm. 366
Schmidelia L. 366
rheedii Wt. 365
Schoenoplectus (Reich.) Palla 657, 658, 696
articulatus (L.) Palla 697
corymbosus (R. & S.) Raynal 696, 697
inclinatus Lye 697
juncoides (Roxb.) Palla 697
lateriflorus (Gmelin) Lye 696, 698
litoralis (Sch.) Palla 696, 698
mucronatus (L.) Palla *110*, 697, 699
senegalensis (Steud.) Palla 697, 699
Schoenorchis Bl. 811, 847
latifolia (Fischer) Sald. 847
Schoenus nemorum Vahl 685
Schumannianthus Gagn. 771, 773
virgatus (Roxb.) *115*, 773
Scilla L. 793, 800
hyacinthina (Roth) Macbride 12, *118*, 800
indica (Wt.) Baker 800
indica Roxb. 800
Scirpus acutangulus Roxb. 671
aestivalis Retz. 675
argenteus Rottb. 676
articulatus L. 697, 699
atropurpureus Retz. 672
barbatus Rottb. 659
bisumbellatus Forsk. 676
capitatus L. 673
chinensis Osb. 688
ciliaris L. 683
cinnamometorum Vahl 677
complanatus Retz. 677
corymbosus auct. 697
corymbosus L. 695
cyperoides L. 661
densus Wall. 659
dichotomus L. 677
diphyllus Retz. 677
dipsaceus Rottb. 678
erectus auct. 697
falcatus Vahl 678
ferrugineus L. 679
fistulosus Poir. 671
geniculatus L. 673
inclinatus Bois. 697

isolepis (Nees) Boeck. 685
jacobii Fischer 699
juncoides Roxb. 697
kernii Raymond 696
lateriflorus Gmelin 698
lithospermus L. 700
litoralis Sch. 698
maritimus L. 658
michelianus L. 667
miliaceus L. 679
mucronatus L. 699
plantagineus Retz. 672
praelongatus auct. 699
retroflexus Poir. 673
schoenoides Retz. 680
squarrosus L. 696
supinus L. 698
supinus auct. 698
thermalis Trabut 698
triangulatus Roxb. 699
uncinatus Willd. 684
Scleria Bergius 657, 699
caricina (R. Br.) Benth. 670
cochinchinensis (Lour.) Druce 701
corymbosa Roxb. 700
elata Thw. 701
foliosa Rich. *110*, 700
hebecarpa Nees 701
levis Retz. 701
lithosperma (L.) Sw. 700
pergracilis (Nees) Kunth 700
terrestris (L.) Fassett *110*, 700, 701
tesselata Willd. 700
Scleropyrum Arn. 302, 304
wallichianum Arn. *59*, 304
Scolopia Schreber 161, 164
crenata (W. & A.) Clos 164
Scoparia L. 515, 524
dulcis L. 525
SCROPHULARIACEAE 25, 515
Scurrula L. 305, 308
cordifolia (Wall.) Don *60*, 308, 309
parasitica L. 308, 309
Scutellaria L. 496, 508
discolor Benth. 508
indica auct. 508
violacea Benth. 509
Scutia (DC.) Brongn. 351
circumscissa (L. f.) Druce 353
myrtina (Burm.) Kurz 311, 353
Sebastiana Sprengel 329, 348
chamaelea (L.) Mueller 348
Secamone R. Br. 439, 452
emetica (Retz.) Sch. 12, 452
Securinega Juss. 329, 348
leucopyrus (Willd.) Mueller 348
virosa (Willd.) Baill. 348
Sehima Forsk. 704, 752
nervosum (Willd.) Stapf 752
Selago pusilla Thunb. 523
Selaginella longipila Hieron 12
Semecarpus L. f. 372, 378
anacardium L. f. 12, 378
grahamii Wt. 375
Senacia nepaulensis DC. 207
Senebiera didyma (L.) Persoon 189
Senecio L. 598, 621
tenuifolius Burm. 621
wightii (DC.) Clarke *104*, 621
Serissa glomerata (Gardner) Bedd. 591
Serpicula verticillata L. f. 634
Sesamum indicum L. 562
orientale L. 562
Sesbania javanica Miq. 269
paludosa (Roxb.) Prain 269
Setaria Beauv. 703, 704, 752
intermedia R. & S. 752
pallide-fusca (S.) S. & H. 752, 753
tomentosa (Roxb.) Kunth 753
Sethia indica DC. 406
Shorea Gaertner 118
roxburghii Don 12, 16, *23*, 119
talura Roxb. 119
Shuteria W. & A. 235, 263
vestita W. & A. 263
Sida L. 146, 154
acuta Burm. 154
cordata (Burm.) Borss. 154
cordifolia L. 155
glauca Cav. 149
indica L. 149
mutica Del. 149
pannosa Forst. 149
persica Burm. 150
polyandra Roxb. 150
rhombifolia L. 154, 155
spinosa L. 154, 155
veronicifolia Lam. 155
Sigesbeckia L. 599, 622
orientalis L. 622
Sinapis juncea L. 189
Sirhookera Kuntze 811, 847
lanceolata (Wt.) Kuntze *129*, 847, 849
latifolia (Wt.) Kuntze *130*, 847, 849

SMILACACEAE 18, 21, 804
Smilax L. 804
ovalifolia Roxb. 806
perfoliata Lour. 804
prolifera Roxb. *120*, 804
wightii DC. 804, 806
zeylanica L. *120*, 804
Smithia Aiton 233, 263
capitata Dalz. 264
conferta Sm. *49*, 264
geminiflora Roth 264
setulosa Dalz. 264
Smithsonia Sald. 811, 850
maculata (Dalz.) Sald. *131*, 850
straminea Sald. *132*, 850
viridiflora (Dalz.) Sald. 850, 851
SOLANACEAE 25, 455
Solandra lobata Murr. 151
Solanum L. 456, 460
bigeminatum Nees 459
erianthum Don 461
ferox auct. 462
indicum auct. 462
khasianum Clarke 461
laeve Dunal 459
melongena L. 463
nigrum L. *88*, 461
rubrum Miller 461
seaforthianum Andr. 461, 462
stramoniifolium Jacq. 461, 462
torvum Sw. *88*, 461, 462
tuberosum L. 16, 463
verbascifolium auct. 461
violaceum Ortega 461, 462
wendlandii Hk. 463
Solena Lour. 174, 178
amplexicaulis (Lam.) Gandhi *36*, 179
Sonchus L. 598, 622
arvensis auct. 622
ciliatus Lam. 622
oleraceus L. 622
wightianus DC. 622
Sonerila Roxb. 286, 289
rheedii W. & A. 15, 290
rotundifolia Bedd. 15, *54*, 290
wallichii Benn. *54*, 290
Sopubia Don 515, 525
delphiniifolia (L.) Don 15, 525
trifida Don 15, 525
Spathodea campanulata Beauv. 537
Spermacoce articularis L. f. 573
brachystema Benth. 574
hispida L. 573
ocymoides Burm. 574
pusilla Wall. 574
stricta L. f. 574
sumatrensis Retz. 579
verticillata L. 574
Sphaeranthus L. 598, 623
hirtus Willd. 623
indicus L. 623
Sphaerocarya wallichiana W. & A. 304
Spilanthes Jacq. 599, 623
acmella auct. 624
calva DC. 623, 624
iabadicensis Moore 624
paniculata DC. 623, 624
Spirodela Schleiden 790
maxima (B. & H.) McCann 790
polyrhiza (L.) Schleiden 12, 790
punctata (Meyer) Thompson 791
Spodiopogon Trin. 705, 753
albidus Benth. 753
rhizophorus (Steudel) Pilger 753
Spondias L. 372, 379
mangifera Willd. 379
pinnata (L. f.) Kurz *74*, 379
Sponia wightii Planchon 75
Sporobolus R. Br. 704, 753
coromandelianus (Retz.) Kunth 754
diander (Retz.) Beauv. 754
fertilis (Steudel) Clayton 754
indicus auct. 754
piliferus (Trin.) Kunth 15, 754
Stachys indica Par. 497
Stachyphrynium Schumann 771, 773
spicatum (Roxb.) Schumann 773
Stachytarpheta Vahl 484, 492
indica (L.) Vahl 492
mutabilis (Jacq.) Vahl 492
trimenii 492
Stapelia adscendens Roxb. 441
STAPHYLEACEAE 29, 361
Staphylea indica Burm. 356
Staurogyne Wall. 538, 560
zeylanica (Nees) Kuntze 560
Staurospermum verticillatum Schum. 581
Stemodia L. 515, 525
hirsuta Benth. 519
repens Benth. 520
sessilis Benth. 520
viscosa Roxb. 525
Stemonurus foetidus Wt. 325
Stenolobium stans (L.) Seemann 537

Stephania Lour. 64, 68
japonica (Thunb.) Miers *2*, *168*
Sterculia L. 139, 143
colorata Roxb. 141
guttata Roxb. *29*, 144
urens Roxb. 144
STERCULIACEAE 23, 27, 29, 30, 138
Stereospermum Chamisso 534, 536
chelonoides auct. 537
personatum (Hassk.) Chatt. *99*, 537
tetragonum DC. 537
Stizolobium P. Br. 259
pruriens (L.) Medicus 259
Stratiotes alismoides L. 634
Streblus Lour. 77, 84
asper Lour. 84
Striga Lour. 515, 526
angustifolia (Don) Sald. 526
asiatica (L.) Kuntze 526
densiflora (Benth.) Benth. *96*, 526, 527
euphrasioides auct. 526
gesnerioides (Willd.) Vatke 526, 527
lutea Lour. 526
orobanchoides (Endl.) Benth. 527
Strobilanthes barbatus Nees 555
canaricus Bedd. 557
caudatus And. 553, 554
ciliatus Nees 555
heyneanus Nees 555
neilgherrensis Bedd. 556
parviflorus Bedd. 556
pulneyensis Clarke 561
rugosus Wt. 555
warrensis Dalz. 556
Strychnos L. 418, 421
colubrina L. 421
dalzellii Clarke *84*, 421
potatorum L. f. 421
Stylocoryne nilagirica (Bedd.) Gamble 591
Stylosanthes Sw. 234, 264
fruticosa (Retz.) Alston 11, 265
mucronata Willd. 265
Swertia L. 423, 426
corymbosa (Griseb.) Clarke *85*, 427
Swietenia chloroxylon Roxb. 383
Symphorema Roxb. 484, 492
involucratum Roxb. *92*, 493
Symphyllia mallotiformis Mueller 336
SYMPLOCACEAE 26, 198
Symplocos Jacq. 198
beddomei Clarke 200
cochinchinensis (Lour.) Moore 15, *42*, 198
racemosa Roxb. *42*, 198, 200
spicata Roxb. 200
Synadenium grantii Hk. 350
Synedrella Gaertn. 599, 624
nodiflora (L.) Gaertn. 624
Synostemon Mueller 329, 349
bacciforme (L.) Webster 349
Syzygium Gaertn. 278, 280
caryophyllaeum auct. 280
caryophyllatum (L.) Alton 280
cumini (L.) Skeels 12, 280, 281, 313
gardneri Thw. 280, 281
hemisphericum (Walp.) Alston 280, 281
heyneanum (Duthie) Wall. 15, *52*, 280, 281
jambolanum (Lam.) DC. 281
jambos (L.) Alston *52*, 280, 282
laetum (Haw.) Gandhi *52*, 280, 282
lanceolatum (Lam.) W. & A. 280, 282
occidentale (Bourd.) Gandhi 280, 282
wightianum W. & A. 282
zeylanicum (L.) DC. 280, 283

Tabebuia argentea (B. & S.) Britt. 537
Tabernaemontana heyneana Wall. 433
Tainia Bl. 810, 852
bicornis (Lindl.) Reich. 852
Tamarindus L. 215, 224
indica L. 224
Tanacetum purpureum Don 610
Tarenna Gaertner 571, 572, 591
asiatica (L.) Schumann 11, 591
nilagirica (Bedd.) Bremek. 591
Taxillus Van Tiegh. 305, 309
bracteatus (Wall.) Van Tiegh. *60*, 309
cuneatus (Roth) Danser 309
incanus (Trimen) Wiens 310
tomentosus (Roth) Van Tiegh. 309, 310
tomentosus auct. 309
Tecoma Juss. 534, 537
stans (L.) Kunth 537
Tectona L. f. 484, 493
grandis L. f. 12, *92*, 493
Teinostachyum Munro 703, 754
beddomei Fischer 755
wightii auct. 755
Tephrosia Persoon 234, 265
calophylla Wt. 12, 265
hirta Ham. 265, 266
pulcherrima (Baker) Gamble 265, 266
purpurea (L.) Persoon 265, 266

suberosa Dc. 260
tinctoria Persoon 266
villosa W. & A. 265
Teramnus P. Br. 235, 266
mollis Benth. 266
Terminalia L. 292, 293
alata Roth 293
bellirica (Gaertn.) Roxb. 12, *55*, 293
chebula (Gaertn.) Retz. 12, *55*, 293, 294.
crenulata Roth 12, *55*, 293, 294
elliptica Willd. 293
paniculata Roth *55*, 293, 294
tomentosa (DC.) W. & A. 293
Terniola Tulasne 269
zeylanica Tulasne 269
Tetranthera attenuata Nees 48
wightiana auct. 48
Tetrastigma Planchon 358, 360
muricatum (W. & A.) Gamble *70*, 360
sulcatum (Lawson) Gamble, *70*, 360, 361
Teucrium L. 496, 509
tomentosum Benth. *93*, 509
Thalictrum L. 60, 63
dalzellii Hk. *11*, 15, 63
THEACEAE 24, 27, 28, 119
THELYPTERIDACEAE 857
Thelypteris dentata (Forsk.) E. St. John 860
indica (V.A.V.R.) Reed 864
laete-strigosa (Cl.) Iwatasuki 864
meeboldii (Rosenst.) Reed 860
ochthodes (Kunze) Ching 865
ornata Ching 862
parasitica (L.) Tard. 861
torresiana (Gaud.) Alston 863
uliginosa (Kunze) Ching 863
wagneri Fosb. & Sachet 859
Themeda Forsk. 705, 755
quadrivalvis (L.) Kuntze 755
tremula (Steudel) Hackel 15, 755, 756
triandra Forsk. 755, 756
Thespesia Correa 146, 155, 156
lampas (Cav.) Dalz. & Gibs. 155, 156
populnea (L.) Correa 12, 156
Thevetia peruviana (Persoon) Schum. 437
Thryocephalon nemorale F. & F. 687
Thunbergia Retz. 538, 560
alata Bojer 560
fragrans Roxb. 560
hawtayneana Wall. 554
laevis Nees 560
mysorensis (Wt.) Anders. 561, Pl. 9
Thunia Reich. 811, 853
venosa Rolfe 853
THYMELAEACEAE 24, 275
TILIACEAE 27, 30, 132
Tithonia Desf. 598, 624
diversifolia (Hemsely) Gray 625
Toddalia Juss. 381, 387
asiatica (L.) Lam. 388
bilocularis W. & A. 388
Tolnifera cochinchinensis Lour. 385
Tolypanthus Bl. 305, 310
lagenifer (Wt.) Van Tiegh. 310
Tomex tomentosa L. 486
Toona (Endlicher) Roemer 390, 395
ciliata Roemer *76*, 395
Torenia L. 515, 527
bicolor Dalz. 527
hirta C. & S. 523
lindernioides Sald. *96*, 527
Toxocarpus W. & A. 439, 452
kleinii W. & A. 452
laurifolius (Roxb.) Wt. 447
Tradescantia cucullata Roth 642
fasciculata Roth 646
malabarica L. 648
paniculata Roth 643
tuberosa Roxb. 646
Tragia L. 327, 349
chamaelea L. 348
hispida Willd. 349
involucrata L. 349
Tragus Haller 704, 756
biflorus Schultes 756
roxburghii Panigrahi 756
Trapa L. 277
bispinosa Roxb. 277
natans L. 277
TRAPACEAE 26, 277
Trema Lour. 72, 75
orientalis (L.) Bl. *14*, 14, 75, 88
Trewia L. 329, 350
nudiflora L. 350
polycarpa Benth. 350
Trianthema L. 94
decandra L. 94
Trias Lindl. 811, 853
stocksii Hk. 853
Tribulus L. 397
lanuginosus L. 397
terrestris L. 397
Trichilia P. Br. 390, 396
affinis Juss. 396

connaroides (W. & A.) Bent. 13, *75*, 396
trijuga Vell. 396
Trichodesma R. Br. 477, 483
indicum (L.) Lehmann 483
zeylanicum (Burm.) R. Br. *91*, 483
Tricholepis DC. 598, 625
radicans (Roxb.) DC. 625
Trichomanes intramarginale Hk. & Grev. 14
plicatum (Bosch.) Bedd. 14
Trichosanthes L. 174, 179
anamalaiensis Bedd. 179
anguina L. 16, 180
bracteata (Lam.) Voigt 179, 180
nervifolia L. 179, 180
palmata Roxb. 179, 180
perrottetiana Cogn. 179, 180
Trichostylis junciformis Nees 678
Tridax L. 599, 625
procumbens L. 626
Trigonella indica L. 263
Trigonospora Holttum 857, 866
ciliata (Benth.) Holttum 866
Triphasia sarmentosa Bl. 386
Tripogon R. & S. 703, 704, 756
bromoides R. & S. 757
capillatus J. & S. 757
pauperculus Stapf 735
Triumfetta L. 132, 137
bartramia L. 138
indica Lam. 138
pilosa Roth *28*, 137
rhomboidea Jacq. 137, 138
rotundifolia Lam. 137, 138
Trophis spinosa Willd. 84
Turpinia Vent. 361
malabarica Gamble 361
Turraea pinnata Wall. 395
TYPHACEAE 21, 758
Typha L. 758
angustata C. & B. 13, *112*, 760
angustifolia L. 760
angustifolia auct. 760
domingensis Persoon 760
Tylophora R. Br. 437, 439, 453
asthmatica (L. f.) W. & A. 454
carnosa Wt. 455
dalzellii Hk. 453
fasciculata Wt. 453
indica (Burm.) Merrill 453, 454
pauciflora W. & A. 453, 454
rotundifolia Wt. 13, 453, 454
tenuis Bl. 453, 455
tenuissima (Roxb.) W. & A. 455

ULMACEAE 23, 72
Ulmus integrifolia Roxb. 75
Unona hookeri King 40
lawii Hk. & Th. 37
narum Dunal 40
ramarowii Dunn 38
Urena L. 148, 156
lobata L. 156
ovalifolia Forsk. 151
sinuata L. 157
Urginea Steinh. 793, 800
indica (Roxb.) Kunth 12, 800
Urochloa Beauv. 706, 757
panicoides Beauv. 757
pubescens Kunth 758
Urostigma arnottianum Miq. 79
benghalense (L.) Gasp. 80
religiosum (L.) Gasp. 82
Urtica heterophylla Wt. 89
interrupta L. 89
longifolia Burm. 87
URTICACEAE 23, 85
Utricularia L. 562
affinis Wt. 566
aurea Lour. 563
australis R. Br. 563
bifida L. 563
caerulea L. 563, 564
caerulea auct. 564
conferta Wt. 564
exoleta R. Br. 12, 563, 564
flexuosa Vahl 563
gibba L. 564
glochidiata Wt. 565
graminifolia Vahl 564, 565
inflexa Forsk. 565
pedicellata Wt. 564
racemosa DC. 564
scandens Benj. 563, 565
smithiana Wt. 565
stellaris L. f. 562, 565
striatula Sm. 563, 565
uliginoides Wt. 564
uliginosa Vahl 563, 566
wallichiana Wt. 565
Uvaria L. 34, 35, 39
narum (Dunal) W. & A. *5*, 39
velutina Dunal 38

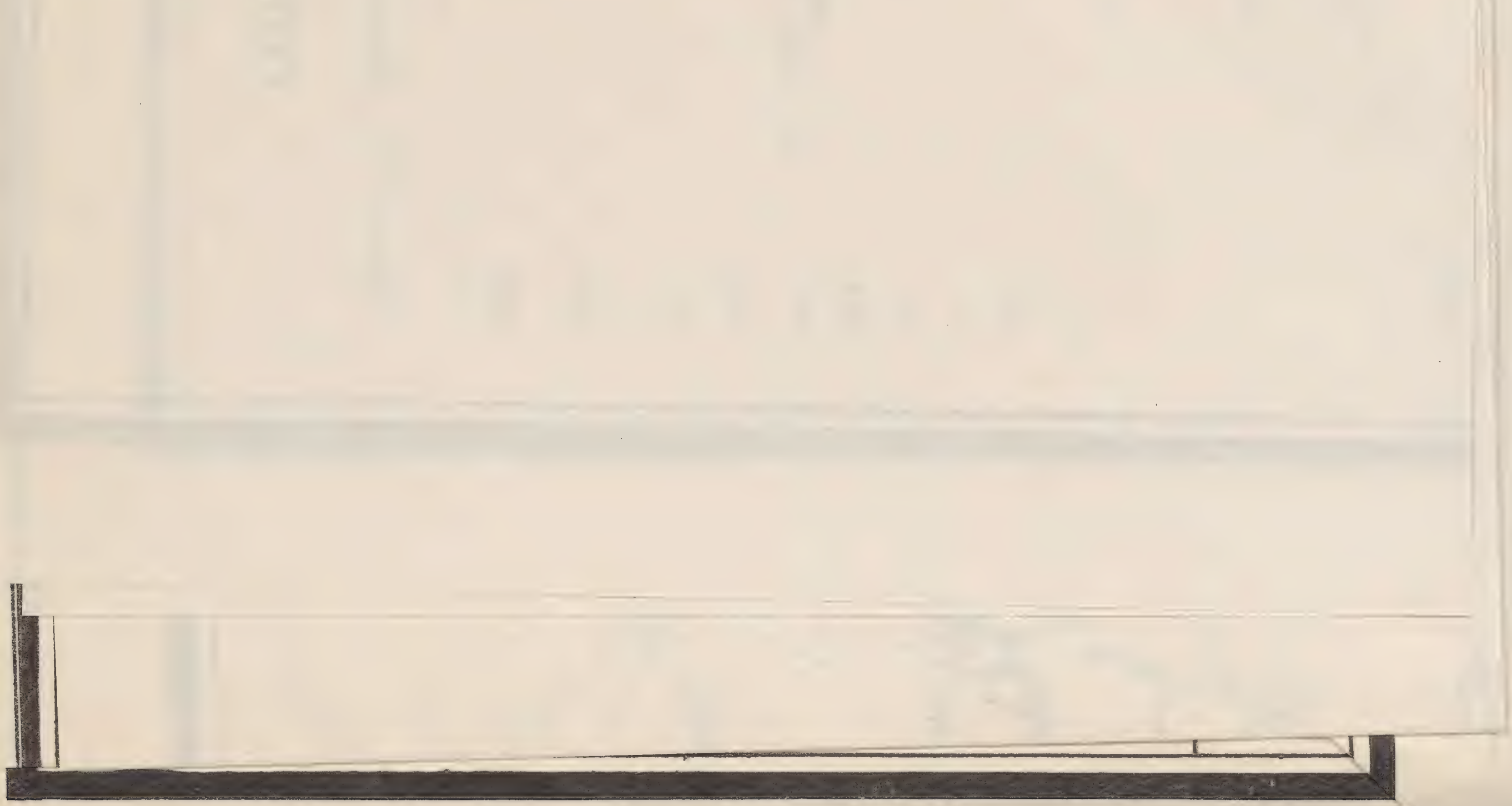
VACCINIACEAE 18
Vaccinium L. 189
neilgherrense Wt. 15, *39*, 191
Vachellia farnesiana (L.) W. & A. 226
Valeriana chinensis L. 92
Vallisneria L. 633, 634
gigantea Graeb. 635
spiralis L. 13, 635
Vanda R. Br. 811, 853
parviflora Lindl. 854
peduncularis Lindl. 816
pulchella Wt. 830
testacea (Lindl.) Reich. 854
tessellata (Roxb.) Don 854
Vandellia crustacea (L.) Benth. 522
nummulariifolia Don 522
pedunculata Benth. 521
scabra Benth. 523
sessiliflora Benth. 522
Vangueria spinosa Roxb. 580
Vateria L. 118, 119
indica L. 14, *23*, 119
malabarica Bl. 119
Ventilago Gaertn. 351, 353
madraspatana Gaertn. *68*, 353
Vepris Juss. 381, 388
bilocularis (W. & A.) Engler *75*, 388
Verbena indica L. 492
mutabilis Jacq. 492
nodiflora L. 490
VERBENACEAE 25, 26, 484
Verbesina acmella L. 603
alba L. 612
bosvallea L. f. 616
lavenia L. 600
nodiflora L. 624
prostrata L. 612
Vernonia Schreber 598, 626
albicans DC. *104*, 626
arborea Ham. 626
cinerea (L.) Less. 626, 627
conyzoides DC. 626, 627
dalzelliana Hutch. *104*, 626, 627
dendigulensis DC. 628
divergens (Roxb.) Edgew. 626, 627
indica Clarke 104, 626, 628
monosis Clarke 627
nilgheryensis DC. 628
Vetiveria Lemaire 705, 758
lawsonii (Hk.) B. & M. 758
Viburnum L. 593, 595
acuminatum DC. 595
punctatum Don *103*, 595
Vicoa Cass. 598, 628
indica (L.) DC. 628
Vigna Savi 235, 266
mungo (L.) Hepper 16
radiata (L.) Wilczek 267
trilobata (L.) Verdcourt 267
umbellata (Thunb.) O. & O. 267
unguiculata (L.) Walp. 16, 268
vexillata (L.) Rich. 267, 268
Vilfa pilifera Trin. 754
Vinca pusilla Murray 432
rosea L. 432
Viola enneasperma L. 165
suffruticosa L. 165
VIOLACEAE 28, 165
Viscum L. 305, 310
angulatum DC. 311
articulatum auct. 311
monoicum Roxb. *60*, 310, 311
mysorense Gamble 9, 310, 311
nepalense Sprengel 311
ramosissimum Wt. 311
Visiania robusta (Roxb.) DC. 513
VITACEAE 18, 29, 356
Vitex L. 484, 493
altissima L. f. 14, 311, 494
leucoxylon L. f. *92*, 494
negundo L. 494
Vitis japonica Thunb. 358
mollissima Wall. 359
muricata W. & A. 360
pallida W. & A. 360
sulcata Lawson 361
tomentosa Roth 358
Volkammania japonica Jacq. 487
Volkameria fragrans Vent. 487
inermis L. 486
japonica Thunb. 487
serrata L. 488

Wagatea Dalz. 215, 224
spicata Dalz. 14, 225, Pl. 4
Wahlenbergia Schrader 568
agrestis auct. 569
erecta (R. & S.) Tuyn *101*, 569
gracilis (Forst.) DC. 569
marginata (Thunb.) DC. *101*, 569
perotifolia W. & A. 569
Walrothia leucoxylon (L. f.) Roth 494
Walsura Roxb. 390, 396
piscidia Roxb. 396

trifolia (Juss.) Harms 396
Waltheria L. 139, 144
americana L. 144
indica L. 144
Wattakaka Hasskarl 439, 455
volubilis (L. f.) Stapf 455
Wendlandia DC. 571, 592
notoniana W. & A. 592
thyrsoidea (R. & S.) Steudel 592
Withania Pauquy 456, 463
somnifera (L.) Dunal 463
Wolffia Schleiden 790, 791
arrhiza (L.) Wimmer 12, 791
globosa (Roxb.) H. & P. 791
microscopica (Griff.) Kurz 791
Wulfenia notoniana Wall. 531

Xanthium L. 597, 629
indicum Roxb. 629
strumarium L. 629
Xantolis tomentosa (Roxb.) Raf. *40*, 194
Xenacanthus Bremek. 540, 561
pulneyensis (Clarke) Bremek. 561
Xeromphis Rafin. 571, 592
spinosa (Thunb.) Keay *102*, 592
uliginosa (Retz.) Mahes. 592, 593
Ximenia L. 299, 301
americana L. *58*, 301
Xylia Bentham 225, 233
dolabriformis Benth. 233
xylocarpa (Roxb.) Taub. 233
XYRIDACEAE 21, 640
Xyris L. 640
pauciflora Willd. 640
schoenoides Mart. 640

Zanthoxylum L. 379, 388
budrunga (Roxb.) DC. 389
connaroides W. & A. 396
rhetsa (Roxb.) DC. 389
triphyllum Wt. 384
Zehneria Endl. 176, 180
maysorensis (W. & A.) Arn. *36*, 181
mucronata auct. 181
scabra (L. f.) Sond. 181
Zeuxine Lindl. 810, 854
gracilis (Breda) Bl. 854
blatteri Fischer 855
longilabris (Lindl.) Hk. 854, 855
Zingiber Boehmer 762, 768
cassumunar Roxb. 769
cernuum Dalz. *113*, 768
macrostachyum Dalz. 769
montanum (Koenig) Link *113*, 768, 769
neesanum (Graham) Ramam. 768, 769
nimmonii Dalz. 768
purpureum Roscoe 769
ZINGIBERACEAE 22, 761
Zizania terrestris L. 701
Ziziphus L. 351, 353
oenoplia Miller 353, 354
rugosa Lam. *68*, 353, 354
xylopyrus Willd. 353, 354
Zornia Gmelin 234, 268
diphylla (L.) Persoon 268
diphylla auct. 268
gibbosa Spanoghe 268
zeylonensis Persoon 268
ZYGOPHYLLACEAE 29, 397



MAP OF
HASSAN DISTRICT

INDIA

DELHI
CALCUTTA
BOMBAY
HASSAN
BANGALORE
MADRAS

REFERENCES

- DISTRICT BOUNDARY
- TALUK BOUNDARY
- TALUK MARK
- HOBLI MARK
- VILLAGE MARK
- ROADS
- RAILWAYS
- HASSAN - MANGALORE RAILWAY LINE (UNDER CONSTRUCTION)
- TANKS
- RIVERS
- HILLS
- STATE FORESTS (F)

KANAKATTE
BANAVAR
NAGPURI
KAREKAL GUDDA
ARSIKERE
HALEBIDU
BELAVATHALLI (F)
BAGESHPUR
GANDASI
GENDEHALLI
BELUR
THAGARE
MADIHALLI
CHIKKANAHALLI
BIKKODU
SHEEGE GUDDA
KONDAJJI
SAL GAME
DUDDA
AREHALLI
NUGGIHALLI
13°00'
HANBALU
DEVALKERE
AGALHATTI
MALGOD
GENKAL BETTA
ALUR
HASSAN
BOURDALORE (F)
SHANTIGRAMA
DANDIGANAHALLI
BAGURU
13°00'
SAKLESPUR OR (MANJARABAD)
SAKLESPUR
BAGI
BALLUPET
PALYA
BYRA (F)
HIRESAVI
GOUDGERE
CHANNARAYAPATNA
KABBINALA (F)
HULLAHALLI
MARANAHALLI
K.HOSKOTE
MAGGE
KUNDUR
KATTAYA
HALEKOTE
SRAVANABELAGOLA
BYAKARWALLI
HARIHALLI
KERIHALLA
KENCHANKUMRI (F)
HOLE
KAGNERI (F)
HETTUR
GORUR
HEMAVATHI Rr.
(F) MALLIPATNA
YASLUR
HOLENARSIPUR
ARKALGUD
BYAGADHALLI
UCHANGI
MANKANHALLI
VANGUR
BISLE GHAT (F)
BISLE
KULGUNDA
HALLIMYSORE
KONANUR
RAMANATHPUR
CAUVERY RIVER

N

AREA: 6940·4 Sq. Kms.

5 0 5 10 15 20 25 30
Kilometers

SMITHSONIAN INSTITUTION LIBRARIES
3 9088 00220518 5
nhbot QK358.F56X
Flora of Hassan District, Karnataka, Ind